



Subject card

Subject name and code	Fundamentals of Materials Science, PG_00072710						
Field of study	Nanotechnology						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2026/2027		
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		3.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Division of Ceramics -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Maria Gazda				
	Teachers		mgr inż. Damian Lewoc dr inż. Daniel Jaworski prof. dr hab. inż. Maria Gazda				
Lesson types	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						
	eNauczanie source addresses: Moodle ID: 8588 Podstawy nauki o materiałach 2026/27 https://enauczanie.pg.edu.pl/2025/course/view.php?id=8588						
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		3.0		36.0	75
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_W05] possesses detailed knowledge of the physical and chemical foundations of nanotechnology (methods of obtaining nanostructures, types of nanostructures, their properties, and basic research methods).	possesses detailed knowledge regarding certain methods for producing materials and nanomaterials	[SW3] Assessment of knowledge contained in written work and projects
	[K6_W01] understands the civilizational significance of materials science and is familiar with the processes occurring throughout the material life cycle (design, manufacturing, use, and disposal).	understands the civilizational significance of materials science and is familiar with the life cycle (design, production, use, disposal) of selected materials, particularly metals	[SW1] Assessment of factual knowledge
	[K6_U04] is able to independently or in a team plan and conduct experiments in nanotechnology and related disciplines, including physics, materials engineering, and chemistry, as well as analyze and interpret the obtained results and formulate conclusions.	Is able to plan and conduct simple experiments involving materials, either independently or as part of a team—for example, by determining points on a phase equilibrium diagram for a salt solution.	[SU1] Assessment of task fulfilment
	[K6_W03] possesses structured knowledge of physics and chemistry, including facts, concepts, methods, and theories enabling the description and explanation of complex phenomena and processes in the field of nanotechnology.	Possesses organized knowledge in the field of the physics and chemistry of materials; is familiar with the concepts and experimental methods used to study and describe the properties of materials, as well as to explain the properties of materials and nanomaterials.	[SW1] Assessment of factual knowledge
Subject contents	Course content – lecture		
	•Introduction: •What is materials science? •Materials and their classification; •Chemical bonds •Gibbs phase rule, phase equilibrium systems •Materials processing, diffusion •Relationships between composition, structure, microstructure, defects, and material properties •Mechanical properties of materials. •Main groups of materials: •Metals and alloys; •Non-metals: •Carbon, silicon, etc.; •Glass and ceramics; •Polymers; •Composites;		
	Course content – laboratory The laboratory course includes the following exercises: identification of materials, hardness testing, and determination of a portion of a phase equilibrium diagram. The exercises will be performed in groups of 2–3 students.		
	Course content – project As part of the project, groups of 2–3 students will receive a sample material to examine and describe in terms of its manufacturing method, structure, microstructure, potential defects, and properties.		
Prerequisites and co-requisites	no		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	project report	55.0%	5.0%
	lab report	55.0%	20.0%
	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		

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 (ν). The same compressive stress acts on two rods made of different materials. E (GPa) G (GPa) Rod no. 115050 Rod no. 2250110 Knowing that Justify 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.
Practical activities within the subject	Not applicable

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