



Subject card

Subject name and code	Fundamentals of Crystallography, PG_00072711						
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	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	30.0	0.0	9.0	0.0	0.0	39
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 8586 Podstawy krystalografii 2026/27 https://enauczanie.pg.edu.pl/2025/course/view.php?id=8586						
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	39		2.0		34.0	75
Subject objectives	Learning the fundamentals of crystallography and understanding the relationship between crystal structure and material properties.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[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 capable of planning and conducting certain analyses, e.g., XRD, density measurement, etc.		[SU1] Assessment of task fulfilment		
	[K6_U01] is able to engage in lifelong self-directed learning and to acquire and synthesize information from literature, databases, and other appropriately selected sources.		is capable of learning independently and finding information on crystal structure, symmetry, ionic radii, etc.		[SU1] Assessment of task fulfilment		
	[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 of crystalline materials, the fundamentals of crystal structure formation, and the influence of size on the structure and selected properties of crystalline materials.		[SW1] Assessment of factual knowledge		

Subject contents	Course content – lecture Fundamental quantities used to describe spatial lattices; crystallographic formulas. Crystal symmetry and symmetry groups. Examples of actual crystal structures, their characteristic features, and certain properties. The reciprocal lattice: definition and physical interpretation. Methods for investigating crystal structures. Structural defects: types and their influence on the properties of crystalline solids. Crystallization and crystal morphology. Physical properties of crystals; anisotropy.		
	Course content – laboratory Crystal growth, mineral identification; determination and description of periodic patterns; Unit cells, atomic packing density; measurement of packing density in disordered systems; Structural analysis (X-ray diffractometry), investigation of anisotropy, density determination using the Archimedes method.		
Prerequisites and co-requisites	no		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lecture - open questions	51.0%	70.0%
	laboratory: average	51.0%	30.0%
Recommended reading	Basic literature	Krystalografia, Bojarski i inni	
	Supplementary literature	Every textbook on crystallography	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1 How many atoms are there per unit cell (cube) shown in Figure 2? What is this structure? What is the coordination number of the larger atom? 2 How are lattice planes designated in a crystal? Draw and label—according to the definition—the (411), (002), and (100) planes in a crystal with an orthorhombic structure and lattice constants $a = 4 \text{ \AA}$, $b = 2 \text{ \AA}$, and $c = 8 \text{ \AA}$. List the indices of planes equivalent to the (100) plane. 3 A crystal has two symmetry planes: one perpendicular to the y-axis and the other perpendicular to the z-axis. Determine all points equivalent to the point with indices: $\frac{1}{4} \frac{3}{4} \frac{1}{2}$. What is the multiplicity of this point? 4 Define packing density and calculate it for the body-centered cubic (BCC) structure. 5 An X-ray diffraction analysis was performed on a single-crystal sample. What information about the material under study can be obtained from the results (include a brief explanation of the data used)?		
Practical activities within the subject	Not applicable		

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