



Subject card

Subject name and code	, PG_00052084						
Field of study	Nanotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2023/2024		
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	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład fizyki nanomateriałów -> Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Wojciech Sadowski					
	Teachers	prof. dr hab. inż. Wojciech Sadowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	E-learning hours included: 0.0						
Additional information: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33618							
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	Thermodynamic and kinetic aspects of the crystallization process (phase equilibrium, diffusion). Fundamentals of nanothermodynamics. The specificity of the process of nanocrystallization. The structure of real crystals - defects. Crystal growth methods (bulk crystals, nanocrystals and nanostructures). Crystal structure analysis methods. Examples of crystallization of selected systems. .						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_K05	The student is able to present the effects of his work, convey information in a generally understandable way, communicate, make self-assessment and constructive assessment of the effects of other people's work.	[SK2] Assessment of progress of work
	K6_U08	He can present the basic facts of materials science and nanotechnology and related fields in a popular way.	[SU1] Assessment of task fulfilment
	K6_W07	Has systematic knowledge of the physical and chemical foundations of nanotechnology	[SW1] Assessment of factual knowledge
	K6_K04	The student is able to work in a team.	[SK1] Assessment of group work skills
Subject contents	<p>1. Thermodynamic and kinetic aspects of the crystallization process (phase equilibrium, diffusion).</p> <p>2. Fundamentals of nanothermodynamics. The specificity of the process of nanocrystallization.</p> <p>3. The structure of real crystals - defects.</p> <p>4. Crystal growth methods (bulk crystals, nanocrystals and nanostructures).</p> <p>5. Crystal structure analysis methods.</p> <p>6. Examples of crystallization of selected systems. .</p>		
Prerequisites and co-requisites	Introduction to nanotechnology. Crystallography.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Credit for the lecture content	50.0%	60.0%
	Preparation of crystal growth project and seminar presentation	100.0%	40.0%
Recommended reading	Basic literature	<p>1. I.V. Markov "Crystal Growth for beginners". World Scientific (2003, 2nd edition)</p> <p>2. D.T.J. Hurle, ed. "Handbook of Crystal Growth", vol. 1-a North Holland (1993)</p>	
	Supplementary literature	<p>1. A. A. Chernov. Modern Crystallography. III Crystal Growth. Springer-Verlag. Berlin Heidelberg New York Tokyo 1984</p> <p>2. Crystal Growth Edited by Brian R. Pamplin, Copyright 1980 Elseier</p> <p>3. Nanocrystals Forming Mesoscopic Structures. Edited by Marie Paule Pileni 2005 WILE-VCH.</p>	
	eResources addresses	<p>Adresy na platformie eNauczenie:</p> <p>Wzrost kryształów - Moodle ID: 33618</p> <p>https://enauczenie.pg.edu.pl/moodle/course/view.php?id=33618</p>	
Example issues/ example questions/ tasks being completed	Pursuant to point subject content.		
Work placement	Not applicable		