



Subject card

Subject name and code	Functional Materials I, PG_00039798						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject				2022/2023	
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	2	Language of instruction				Polish	
Semester of study	4	ECTS credits				3.0	
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						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Maria Gazda					
	Teachers	dr inż. Sebastian Wachowski dr hab. inż. Aleksandra Mielewczyk-Gryń 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	15.0	0.0	0.0	45
	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	45	2.0		28.0		75
Subject objectives	Learning about functional materials due to their thermal, electrical, optical and other properties, learning about selected technologies for their production, examples of applications						
Learning outcomes	Course outcome	Subject outcome				Method of verification	
	K6_K01	understands the need to improve professional and personal competences; is aware of his own limitations and knows when to turn to experts, is able to properly set priorities for the implementation of tasks within the laboratory of functional materials				[SK2] Assessment of progress of work	
	K6_W03	has basic knowledge in the field of materials science of functional materials, is able to relate their properties with structure and composition, knows the theoretical description of phenomena such as diffusion, electrical conductivity, ionic conductivity, etc.				[SW1] Assessment of factual knowledge	
	K6_U01	can use properly selected experimental methods and selected devices to characterize functional materials				[SU1] Assessment of task fulfilment	
	K6_U02	is able to operate laboratory equipment such as balances, ovens, microscope, diffractometer				[SU1] Assessment of task fulfilment	

Subject contents	Introduction Introductory information Review: structure, defects, bonds vs. properties, thermodynamics; - Diffusion; Solid phase reactions. Functional materials thanks to their electrical properties: Electronic and electrotechnical materials: metals; Electronic and electrotechnical materials: semiconductors; Superconductors; Dielectrics; Production and shaping of functional materials: -Production of single crystals; Thin layers; Lithography, etching and other semiconductor technologies; integrated circuit, connections between different materials; Other functional materials - Glass and aerogels;		
Prerequisites and co-requisites	no		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lab: participation and reports	51.0%	30.0%
	lecture: written test	51.0%	70.0%
Recommended reading	Basic literature	Blicharski, Inżynieria materiałowa	
	Supplementary literature	Scientific literature, e.g.. Materials Today	
	eResources addresses	Podstawowe https://enauczenie.pg.edu.pl/moodle/course/view.php?id=27783 - Moodle course Adresy na platformie eNauczenie:	
Example issues/ example questions/ tasks being completed	Mechanisms of solid state diffusion Factors affecting the rate of solid state synthesis What properties of a superconductor are important if we want to use it to produce an electromagnet with $B=10\text{ T}$ Methods of applying thin layers. Describe one. How can you influence: glass color/hydrophilic/phobic properties etc.		
Work placement	Not applicable		

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