



Subject card

Subject name and code	Nanostructures in glasses and amorphous materials, PG_00031637						
Field of study	Nanotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	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	dr inż. Leszek Wicikowski					
	Teachers	dr inż. Leszek Wicikowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30	0.0		0.0		30
Subject objectives	The main aim is to present the fundamental knowledge and achievements in preparation of different nanostructures in glasses and amorphous materials and also to indicate their application in materials technology.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U06	The student can provide methods of producing nanostructures in amorphous materials using the knowledge of physics, chemistry and material engineering			[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task		
	K6_W07	The student knows the importance of nanostructures in defining the properties of materials. Can identify research tools for their characterization.			[SW3] Assessment of knowledge contained in written work and projects		
Subject contents	Glassy state of matter. Glass transition. Glass formation criteria. Short range order. Phase separation. Processes of crystallization and nano-crystallization. Classification of inorganic oxide glasses. Special glasses: chalcogenide and metallic glasses. Preparation of glasses and amorphous materials. Aerogels and sol-gel films. Physical properties of glasses. Amorphous semiconductors (amorphous silicon, mobility gap, defects). Optical and electrical properties of glasses containing metallic and semiconducting nanostructures. Optical nonlinearity in glasses. Application of amorphous materials in electronics and opto-electronics.						
Prerequisites and co-requisites	Fundamental knowledge in solid state physics and quantum physics						
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Final colloquium	50.0%			67.0%		
	Essay	100.0%			33.0%		

Recommended reading	Basic literature	<p>1. R. Zallen, The physics of amorphous solids, Wiley NY, 1983</p> <p>2. Fuxi Gan and Lei Xu, Photonic Glasses, World Scientific, 2006</p> <p>3. S.R. Elliott, Physics of amorphous materials, Wiley, 1990</p> <p>4. J. Zarzycki, Glasses and the vitreous state, Cambridge University Press, 1991</p> <p>5. Arun K. Varshneya, Fundamentals of Inorganic Glasses</p>
	Supplementary literature	Scientific publications concerning topics of seminars
	eResources addresses	Adresy na platformie eNauczenie:
Example issues/ example questions/ tasks being completed	<p>Glassy state of matter. Glass transition. Glass formation criteria. Short range order. Phase separation. Processes of crystallization and nano-crystallization. Classification of inorganic oxide glasses. Special glasses: chalcogenide and metallic glasses. Preparation of glasses and amorphous materials. Aerogels and sol-gel films. Ionic and electronic conductivity in glasses. Thermal properties of glasses and aerogels. Electrical properties of amorphous semiconductors (amorphous silicon, mobility gap, defects). Optical and electrical properties of glasses containing metallic and semiconducting nanostructures. Optical nonlinearity in glasses.</p>	
Work placement	Not applicable	