

Subject card

Subject name and code	Physics of Materials I, PG_00039806								
Field of study	Materials Engineering, Materials Engineering Materials Engineering								
Date of commencement of studies	October 2021		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	3		Language of instruction			Polish			
Semester of study	5		ECTS credits			4.0	4.0		
Learning profile	general academic profile		Assessment form			exam			
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics								
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Barbara Kościelska							
	Teachers		dr inż. Marta Prześniak-Welenc						
			Michał Maciejewski						
			prof. dr hab. inż. Barbara Kościelska						
			prof. di fiab. i	JSCIEISK	1				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	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		5.0		50.0		100	
Subject objectives	The main aim is to gi properties of material	ve the fundame	ental knowledge	e in solid state	physics	and al	so the interp	retation physical	
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	K6_W03		Basic knowledge of materials science and the ability to connect the internal structure of materials with their response to external conditions.			[SW1] Assessment of factual knowledge			
	K6_K01					[SK5] Assessment of ability to solve problems that arise in practice			
	K6_U01		Ability to select analytical and experimental methods to measure selected properties of materials.			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools			

Data wydruku: 09.04.2024 14:16 Strona 1 z 2

1. A short introduction to atomic and quantum physics. 2. Crystal brinding energy. Bonds: ionic, covalent, metallic, molecular. Crystal structure. 3. Thermal properties of solids. Vibrations of atoms in crystals - phonons. Phonon statistics. Density of states. Specific heat: Dulong-Petit law, Einstein and Debye models. Thermal conductivity of solids. Thermal conductivity of solids. Thermal conductivity of solids. Thermal conductivity of solids. Thermal conductivity and specific heat. 4. Classical theory of free electrons in metal. Electrical conductivity of metals. Quantum models of electrons in a crystal. Density of electronic states. Crystal band structure. Electronic thermal conductivity and specific heat. 5. Semiconductor crystals. Electron statistics - concentration of intrinsic carriers. Fermi level in an intrinsic semiconductor. Conductivity, Doping states. Equation of electrical neutrality of a semiconductor. Fermi level in a cytoped semiconductor. Inclusion energy of the admixture. Conductivity of doped semiconductors. Fermi level in a cytoped semiconductor. Accordance in a cytoped semiconductor. Inclusion energy of the admixture. Conductivity of doped semiconductors. Fermi level in a cytoped semiconductor. Accordance in a cytoped semiconductor. Inclusion energy of the admixture. Conductivity of doped semiconductors. 6. Examples of semiconductor devices. 7. Glasses and amorphous materials and their preparation. Short-range ordering, transition from liquid phase to glass phase. 8. Dielectrics. Macroscopic and macroscopic description of magnetic materials. Diamagnetism, paramagnetism, ferromagnetism. 10. Superconductivity, properties of the superconducting state. I and II - type of superconductors, Cooper pairs, high temperature superconductors and paramagnetism. Perconductors and paramagnetism. Perconductors and paramagnetism. 11. Superconductivity in properties of the final grade written exam. 12. Superconductivity, Macroscopic properties of superconductors and paramagnetism. Perconductors and paramagn	Subject contents							
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	Work placement		Not applicable					

Data wydruku: 09.04.2024 14:16 Strona 2 z 2