

Subject card

Subject name and code	Physical basis of radiation detection with elements if condensed phase physics, PG_00154415						
Field of study	Medical Physics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	postgraduate studies		Subject group				
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish not applicable		
Semester of study	2		ECTS credits		6.0		
Learning profile	academic		Assessment form				
Conducting unit	Zakład Spektroskopii Fazy Skondensowanej -> Instytut Fizyki Doświadczalnej -> Faculty of Mathematics, Physics and Informatics -> Rektor						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Sebastian Mahlik				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	45.0	0.0	0.0	0.0	90
	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	90		0.0		90.0	180
Subject objectives	1. Understanding at an academic level the basic knowledge of crystallography, the band structure of solids, and the electrical and thermal properties of solids.2. Understanding the processes of interaction between radiation and solids.3. The ability to independently predict the effects of interactions between radiation and matter and their practical applications.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[FIZMEDMU2_W01] has extended knowledge in the field of general physics and advanced knowledge in a selected area of physics; knows the history of the development of physics and its importance for the progress of science and life sciences, knowledge of the world and social development		not applicable		[SW4] test/exam - oral or written [SW3] text preparation/written work		
	[FIZMEDMU2_U01] can apply the scientific method in solving physical problems, carrying out experiments and reasoning		not applicable		[SU3] text preparation/written work [SU4] test/exam - oral or written		

Subject contents	Lecture Topics: 1. Structure of Solids (Crystals): - Types of crystal bonds - Crystal structures - X-ray diffraction on crystals - Reciprocal lattice, pseudomomentum, Brillouin zones - Crystal lattice defects 2. Crystal Growth: - Czochralski method - Bridgman method - Methods for obtaining crystal layers 3. Mechanical, Electrical, and Thermal Properties of Crystals: - Lattice vibrations, quantum approach, phonons (optical and acoustic branches) - Raman effect 4. Electrical Properties of Solids: - Energy structure (phenomenological approach) - Fermi electron gas - Band structure (quantum approach) 5. Semiconductors and Dielectrics: - Carrier dynamics (electrons and holes), effective mass - Hall effect - Intrinsic semiconductors in thermal equilibrium, density of states - Doped semiconductors, donor and acceptor states, p-n junctions, p-n-p, n-p-n junctions 6. Localized States Associated with Defects and Impurities: - Electron and hole traps 7. Interaction of Electromagnetic Radiation with Solids: - Absorption, luminescence, scintillation 8. Radiation Detectors: - Dielectric crystals, semiconductor detectors, other detectors 9. Detector Systems for Diagnostic and Imaging Applications 10. Thermoluminescence Phenomenon and Its Application in Dosimetry		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	not applicable	51.0%	40.0%
	not applicable	0.0%	10.0%
	not applicable	51.0%	50.0%
Recommended reading	Basic literature	not applicable	
	Supplementary literature	not applicable	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	not applicable		
Work placement	Not applicable		

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