



Subject card

Subject name and code	Physical testing methods of materials, PG_00063957						
Field of study	Nanotechnology						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	second-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	1		Language of instruction		English		
Semester of study	2		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marek Chmielewski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	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 aim of the course is to prepare the student for experimental work in the field of multi-path testing of materials using non-destructive diagnostic techniques used to study the physical properties of matter, structures of the matter and to defects detections procedures.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U07] can apply the obtained specialist knowledge to the problems within exact sciences, natural or technical sciences.	The student will know the capabilities of different measurement techniques, discovers and suggests the possibility of their effective use in areas other than those performed during the lab	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K7_K03] can cooperate and work as part of a team, adopting different roles. Can self-evaluate, and give constructive feedback on the work of others.	Work in the laboratory in group consist with three students. Cooperation in order to achieve the intended results. Planning and allocation of functions and roles in the process of handling the measuring equipment and data acquisition.	[SK1] Assessment of group work skills
	[K7_W06] Has extended knowledge on the methodology of physics laboratory work, supported with experience in laboratory work. Knows the rules of occupational health and safety to a degree sufficient for independent work at a research and measuring position.	Students will know the structure and operation of equipment used in study of materials, with particular emphasis on ultrasonic flaw detectors, measures the magnetic field, eddy currents meter, a device for measuring voltage pulses Barkhausen effect, magnetic recording systems dispersive device generation and detection of magnetostrictive pulses.	[SW1] Assessment of factual knowledge
	[K7_U05] can plan and conduct experimental and critical research and analyze their results, draw conclusions and formulate reasoned conclusions – within their specialization.	The student presents the seminar and critically analyze scientific works in the field of materials testing, carried out the review process and presenting it to the public before leading the group and other students. Publicly trying confirm and justify their conclusions.	[SU5] Assessment of ability to present the results of task
Subject contents	The student will know non-destructive methods based on measurement of physical quantities such as the value of induction and magnetic field, the intensity of Barkhausen noise effect, magnetostrictive and ultrasonic wave pulses for materials parameters describing. Students will know the methodology of the study of thin coatings, he will testing methods of flaw detection of materials based on the measurement of electrical resistivity, magnetic properties, acoustic properties and internal friction. Lecture: During the lecture will presents subjects listed below Method of defectoscopy: Radiological method Endoscopes method Magnetic field leakage method Ultrasound method Eddy Current Method Acoustic emission method Other methods Material investigation methods: Radiological method of material investigation Ultrasound method Electromagnetic method Mechanical spectroscopy method Hardness measurement method Stress determination methods Radiological method of stress determination Neutronographical method of stress evaluation Ultrasound method Magnetic method, Barkhausen effect method		
Prerequisites and co-requisites	not required		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	50.0%	40.0%
	Labor	100.0%	60.0%
Recommended reading	Basic literature	Handbook of measurements of residual stresses; ed. J. Lu; The Fairmont Press, 1996. Articles from NDT&E Journal	
	Supplementary literature	not required	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Nondestructive investigation, Barkhausen effect		
Work placement	Not applicable		

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