GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physical testing methods of materials, PG_00063957		
Field of study	Nanotechnology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marek Chmielewski	
	Teachers	dr hab. inż. Leszek Piotrowski dr inż. Marek Chmielewski	

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_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
[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 safetyto 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_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_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

Subject contents

The student will know non-destrucive 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 Neutrongraphical 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
Labor	100.0%	60.0%
Lecture	50.0%	40.0%

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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