GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physical testing methods of materials, PG_00071203		
Field of study	Nanotechnology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Magnetic Properties of Materials -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Leszek Piotrowski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	30.0	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	1.0	19.0	50

Subject objectives

The aim of the course is to prepare the student for experimental work in the field of multiparametric non-destructive testing both in the field of flaw detection (eddy currents, MFL) and diagnostics (stress state and its impact on the Barkhausen effect).

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U04] is able to formulate hypotheses, plan and conduct experimental research, critically analyze results, verify hypotheses, draw conclusions, and formulate well-founded opinions within nanotechnology and related physical and natural sciences. Recognizes economic and non-technical aspects of the activities performed	The student understands the role of the calibration process and preliminary research in the process of analysis of measurement data. He/she is able to analyse the results of measurements and on this basis is able to assess the correctness of the hypotheses. Student is able to indicate possible causes in case of receiving erroneous results.	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task
[K7_K01] is able to cooperate and work effectively in a group, assuming different roles depending on changing needs. Adheres to the principles of professional ethics and demonstrates creativity and entrepreneurship. Is capable of self-assessment as well as constructive evaluation of the work of others.	Students develop effective methods of work by sharing responsibilities – measurements, calculations, processing of results.	[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness

<table>
<tr><td>Subject contents</td><td>Course content – laboratory

• Measurements of the magnetic flux leakage
• Stress state evaluation using the Barkhausen effect
• Ultrasonic Testing
• Magnetostrictive pulses in long-range flaw detection of pipes
• Eddy currents</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the basics of magnetism . Elementary knowledge of wave propagation . Ability to analyze measurement data</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Lab reports</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>Handbook Of Nondestructive Testing, Charles J. Hellier, McGRAW-HILL 2ed 2012</td></tr><tr><td>Supplementary literature</td><td>Nondestructive Testing (NDT)

Giuseppe Lacidogna mdpi 2021</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Data analysis using the LabVIEW environment

Stress/strain distribution valuation in proximity of a weld seam. Surface cracks depth estimation. Flaw detection on long pipes with limited access with the help of guided waves. Thin coatings thickness determination with the help of eddy currents.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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