GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Non-invasive measurement methods, PG_00069761					
Field of study	Informatics, Electronics and Telecommunications, Biomedical Engineering, Biomedical Engineering, Biomedical Engineering, Space and Satellite Technologies, Automatic Control, Cybernetics and Robotics					
Date of commencement of studies	February 2025		Academic year of realisation of subject		2025/2026	
Education level	second-cycle studies		Subject group			
Mode of study	Full-time studies		Mode of delivery		at the university	
Year of study	1		Language of instruction		Polish	
Semester of study	2		ECTS credits		2.0	
Learning profile	general academic profile		Assessment form		assessment	
Conducting unit	Department of Optoelectronics -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology					

Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marcin Gnyba
	Teachers	dr hab. inż. Marcin Gnyba

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=2036						

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	2.0	18.0	50

Subject objectives	Improving students knowledge and skills in the area of proper selection of non-invasive measurement methods, measurement implementation and measurement data processing.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	The student knows the physical basis of selected measurement methods and the scope of their applications, as well as the methodology for implementing measurements and processing measurement data.	[SW1] Assessment of factual knowledge
	[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	The student is able to correctly select a measurement method to solve a specific measurement, correctly determine the measurement conditions, configure the measurement system, carry out the measurement and analyze the measurement data.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents	Course content – lecture
	Non-destructive measurements. Spectroscopic measurements. Laser spectroscopy. In-situ testing. Inter-operational measurements of technological processes. Molecular and crystallographic structure studies. Coupling measurement equipment with the object under test. Application of optical fibers in spectroscopic measurements. Rapid diagnostics of biomedical objects. Safe measurement execution. Measurement data processing. Measurement data interpretation.
	Course content – laboratory 1. Configuring and adjusting the optical measurement system. 2. Defining and optimizing measurement conditions. 3. Measuring biological samples. 4. Testing inorganic electronic materials. 5. Qualitative analysis of spectra. 6. Quantitative analysis of spectra.

Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	theoretical knowledge test	50.0%	50.0%
	passing the laboratory	50.0%	50.0%

Recommended reading	Basic literature	1. E. Smith, G. Dent, Modern Raman Spectroscopy. A Practical Approach, John Wiley and Sons Ltd, 2019. 2. K. Małek, Spektroskopia oscylacyjna Od teorii do praktyki, Wydawnictwo Naukowe PWN 2016. 3. G. G. Hoffmann, Infrared and Raman Spectroscopy. Principles and Applications, De Gruyter, 2023. 4. W. Demtroeder, Spektroskopia laserowa, Wydawnictwo Naukowe PWN, 1993.
	Supplementary literature	It will be given during the lecture.
	eResources addresses	

Example issues/ example questions/ tasks being completed	1. Applications and limitations of spectroscopic methods. 2. Optical systems for non-destructive testing. 3. Principles of optimizing the operating conditions of spectroscopic systems. 4. Lasers used in molecular-crystallographic spectroscopy. Principles of selection.
Practical activites within the subject	Not applicable

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