



Subject card

Subject name and code	Ultrasound Diagnostics, PG_00048380						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2026		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		Subject group		Optional subject group Specialty subject group 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		Polish		
Semester of study	1		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department Of Signals And Systems -> Faculty Of Electronics Telecommunications And Informatics -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Lech Kilian				
	Teachers		dr inż. Lech Kilian				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	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		4.0		16.0	50
Subject objectives	The aim of the course is to acquaint students with the physical properties of sound fields for transmission, processing and display of ultrasonic signals and ultrasonic apparatus.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Student presents a preliminary design of the selected diagnostic device.	[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Student discusses the phenomenology and structure of diagnostic systems in the selected field of application.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
	[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	Student presents physical properties of acoustic waves used for diagnostics in various fields of technology and medicine.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
	[K7_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of advanced technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Student presents a review and assesses the value of methods and ultrasonic diagnostic systems in various fields.	[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
Subject contents	1. Introduction domains of application of ultrasonic diagnostics 2. Physical basis of ultrasound diagnostics. Acoustic waves 3. Acoustic physical quantities and their units 4. Radiation and directional reception, focusing 5. Energy in ultrasonic field 6. Propagation of acoustic waves 7. Transmission losses 8. Doppler effect 9. Transducers and ultrasonic heads. Technologies 10. Construction 11. Parameters 12. Electronic focusing and beam steering in transmitting and receiving heads 13. Methods and devices in technical diagnostics and ultrasonography. Special signal processing techniques in ultrasonic diagnostic devices 14. Diagnostics in technical applications - - defectoscopes 15. Distance meters, detection of motion parameters 16. Ultrasonography, domains of application 17. Structure and technical parameters of ultrasonographs 18. Examples of ultrasonography equipment 19. Development trends		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Presentation	60.0%	50.0%
	Midterm colloquium	60.0%	50.0%
Recommended reading	Basic literature	1. Iniewski K. Medical Imaging - Principles, Detectors, and Electronics. Wiley & Sons 2009.	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie:	

Example issues/ example questions/ tasks being completed	Diagnostic equipment: types of ultrasound, the frequency used Directional effects of acoustic waves transmission. Transmission of acoustic waves. Types and structure of the diagnostic head. The structure of the transmitters and receivers. The development of imaging in the diagnostic apparatus. Doppler effect
Work placement	Not applicable

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