GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Ultrasound Diagnostics, PG_00048380		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
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 -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Lech Kilian	
	Teachers	dr inż. Lech Kilian	

Lesson types

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_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.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task
[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.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[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.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[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	Sstudent presents a preliminary design of the selected diagnostic device.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task

Subject contents

Course content – lecture
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 acosutic 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
Midterm colloquium	60.0%	50.0%
Presentation	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	

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
Practical activites within the subject	Not applicable

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