

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Microwave Engineering, PG_00048081								
Field of study	Electronics and Telecommunications								
Date of commencement of studies	October 2022		Academic year of realisation of subject			2024/2025			
Education level	first-cycle studies		Subject group			Optional 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	3		Language of instruction			Polish			
Semester of study	6		ECTS credits			2.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Department of Microwave and Antenna Engineering -> Faculty of Electronics, Telecommunications and Informatics							ions and	
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Lech							
	Teachers		dr inż. Małgorzata Warecka						
			dr hab. inż. Rafał Lech						
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Project	t	Seminar	SUM	
of instruction	Number of study hours	15.0	0.0	15.0	0.0		0.0	30	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity	ivity Participation in classes include plan		didactic Participation in ed in study consultation hours		Self-study SUM			
	Number of study hours	30		2.0		18.0		50	
Subject objectives	Student acquainted with the basic operation principles, parameters and design methods of the waveguides and microwave circuits The guides include waveguides and transmission lines with TEM wave. Procedures for microwave circuit design, including lumped elements circuits, microwavel dividers, couplers, phase shifters and non-reciprocal ferrite devices are determined on the base of their scattering matrix.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions		Student acquainted with the basic operation principles, parameters and design methods of the waveguides and microwave circuits The guides include waveguides and transmission lines with TEM wave. Procedures for microwave circuit design, including lumped elements circuits, microwavel dividers, couplers, phase shifters and non- reciprocal ferrite devices are determined on the base of their scattering matrix.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools			
	[K6_W34] Knows the characteristics of telecommunications channels, methods of securing information, modulation systems, methods of access to the channel.		student acquainted with the basic operation principles, parameters and design methods of the waveguides and microwave circuits The guides include waveguides and transmission lines with TEM wave. Procedures for microwave circuit design, including lumped elements circuits, microwavel dividers, couplers, phase shifters and non- reciprocal ferrite devices are determined on the base of their scattering matrix.			I Swij Assessment of factual knowledge			

Subject contents	Lecture 1. Waveguides and resonators: rectangular, cylindrical, ridge, dielectric, technology, equivalent circuits and their parameters, loop excitation, dipole2. Coaxial and strip lines and resonators, multi-conductor TEM lines, technology, equivalent circuit, higher types of field TM, TM, coaxial junctions3. Integrated lines and resonators; microstrip, slot, coplanar, equivalent circuits and wave parameters and natural frequencies of the basic type, surface waves, higher types of field4. Planar and layer-coupled strip lines, microstrip, slot; even and odd types, their equivalent circuits and wave parameters. Impedance matching methods - tuning devices6. Design of multi-section impedance transformers with maximally flat and Chebyshev characteristics7. Principles of designing non-uniform impedance transformers8. Discontinuities in waveguides, strip lines and microstrip lines and their equivalent circuitsLaboratory1. Measurement of single-and multi-port planar systems - The aim of the exercise is to familiarize yourself with the operation and measurement of passive planar systems parameters such as: antennas, branches, and crossed lines.2. Examination of filtering structures - The aim of the exercise is to familiarize yourself with the operation of filtering structures made in various technologies: resonators, filters and diplexers.3. Mutual and non-mutual multi-port systems - The aim of the exercise is to familiarize yourself with the operation of filtering structures made in various technologies) and non-mutual (three- and four-port circulators).4. Measurement of lumped constant elements using the high-frequency technique - The aim of the exercise is to become familiar with the behaviour of lumped constant elements connected to high-frequency signal sources.						
Prerequisites and co-requisites	No requirements						
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade				
	Assessment after the lecture	60.0%	60.0%				
	Laboratory exercises	40.0%	40.0%				
Recommended reading	Basic literature Supplementary literature eResources addresses	S. Rosłoniec "Liniowe obwody mikrofalowe" WKŁ 1999 2. R. Lech - lectures material eNauczanie Kowalczyk P., Lech R., Mazur J., Technika wysokich częstotliwości w zadaniach, Wydawnictwo PG 2022 D.M. Pozar "Microwave engineering" J. Willey&Sons, 1998 No requirements Adresy na platformie eNauczanie:					
		Interior na plationne enadozanie.					
		https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43899					
Example issues/ example questions/ tasks being completed	a list of sample questions for the exam can be found in the course on the eNauczanie platform						
Work placement	Not applicable						

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