GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	High Frequency Measurement Automation , PG_00048663		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2022/2023
Education level	second-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	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 Microwave and Antenna Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Lech	
	Teachers	dr hab. inż. Rafał Lech	

Lesson types and methods of instruction	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						

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	Familiarizing yourself with the measurements methods and techniques of basic parameters which are necessary, from a practical point of view, to evaluate the performance of the RF devices and systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	The student is able to choose the appropriate method of network analyzer calibration, he/she can calibrate the microwave analyzer in the high frequency range and perform measurements of basic parameters of RF elements.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions	The student measures the parameters of single or multiport RF systems, using a network analyzer, spectrum analyzer or reflectometer, and assesses the operation of the measured system based on the obtained results.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K7_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	The student is able to interpret and process measurement results. The student knows the embedding and de-embedding methods that allow the measured object to be embedded into a network of virtually existing systems, or to remove unwanted parts of the measured object from the measurement results.	[SW1] Assessment of factual knowledge
[K7_W06] Knows and understands, to an increased extent, the basic processes taking place in the life cycle of devices, facilities and technical systems.	The student knows the structure of the spectrum analyzer and network analyzer, which allows understanding the principles of their operation and selection of appropriate calibration methods.	[SW1] Assessment of factual knowledge
[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.	The student knows the structure of the spectrum analyzer and network analyzer in the full version as well as its simplified implementations and on this basis selects the appropriate calibration method to calibrate the microwave analyzer in the high frequency range and carry out measurements of the basic parameters of RF elements.	[SW1] Assessment of factual knowledge

Subject contents

1. Measuring equipment
2. Automated measurements of scattering parametres of multiport devices: electronic calibrators, calibration techniques, data processing, time reflectometry
3. Vector network analyzer: measurement capabilities, structure, simplified implementations, calibration
4. Spectrum Analyzers: measurement capabilities, structure, signal sampling techniques, the choice of detector
5. Techniques for locating faults in transmission circuits
6. Techniques to extend the capabilities of measuring microwave network analyzers

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lab. reports	50.0%	50.0%
Exam	50.0%	50.0%

Recommended reading

Basic literature	1) Christoph Rauscher: "Fundamentals of Spectrum Analysis", Rohde & Schwarz GmbH & Co. KG, 5th Ed., Monachium, 2007 2) Michael Hiebel: "Fundamentals of Vector Network Analysis", Rohde & Schwarz GmbH & Co.KG, 1st Ed., Monachium, 2007
Supplementary literature	brak
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

1. Briefly compare the advantages and disadvantages of hardware and software reflectometry
2. Time reflectometry in RF measurements
3. Briefly compare electronic and mechanical calibration of vector network analyzer
4. Reflectometric measurement method for measuring reflection parameters.
5. Block diagram of the reflectometer for measuring the modules of reflection and transmission parameters.
6. Calibration techniques of vector network analyzer.
7. Discuss selected reflectometric system to measure reflection parameter.
8. Block diagram and operation of the vector network analyzer.
9. Discuss the selected implementations of simplified vector network analyzer.

Work placement

Not applicable