GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	High Frequency Technique, PG_00038900		
Field of study	Space and Satellite Technologies, Space and Satellite Technologies		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
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	3.0
Learning profile	general academic profile	Assessment form	assessment
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 dr inż. Małgorzata Warecka	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	15.0	0.0	45

E-learning hours included: 0.0

Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=1621

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	45	0.0	0.0	45

Subject objectives

Acquisition by students of knowledge and practical skills in the field of analysis and measurement of high frequency and microwave devices.

Learning outcomes

Course outcome	Subject outcome	Method of verification

Subject contents

1. The basics of the electric field. Field intensity. Work in the electric field.
2. Potential, voltage and electric current. Ohm law.
3. Electromotive force. Kirchhoff's laws.
4. Electrical capacity. Gaussian law.
5. Magnetic field. Current as source of magnetic field.
6. Faraday induction law. Self and mutual inductance.
7. High frequencies. TEM waveguides.
8. SWR and reflection coefficient. Characteristic impedance.
9. Transformation of the impedance. Half-wave and quarter-wave transformers.
10. Smith Chart.
11. Matching systems.
11. Resonant circuits and resonators.
12. Coaxial and two-wire line. Microstrip lines.
13. Scattering matrix. Simple microwave systems.
14. Waveguides and resonant cavities
15. Test.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	50.0%	30.0%
Lecture	50.0%	30.0%
Laboratory	50.0%	40.0%

Recommended reading	Basic literature	1. R. Lech "Technika BWCZ" lecture materials, mwave.eti.pg.gda.pl 2. P. Kowalczyk, R. Lech, W. Zieniutycz "Podstawy elektromagnetyzmu w zadaniach", Wydawnictwo Politechniki Gdanskiej, Gdansk 2007 3. P. Kowalczyk, R. Lech, W. Zieniutycz "Pola i Fale Elektromagnetyczne w Zadaniach", Wydawnictwo Politechniki Gdanskiej, Gdansk 2015; 4. M. Suski "Technika Mikrofalowa" WNT 1979
	Supplementary literature	1. D. Pozar "Microwave engineering" J.Willey&Sons, 1998
	eResources addresses	Adresy na platformie eNauczanie: Technika Bardzo Wysokich Częstotliwości TKiS - 23/24 - Moodle ID: 20866 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=20866
Example issues/ example questions/ tasks being completed	1. Application of the Smith chart 2. Write down and discuss Gauss's law 3. Write down and discuss Faraday's law 4. Write down and discuss Amper's law 5. How will the wavelength and phase velocity change after moving from air to a lossless medium with a given permeability? 6. What is the displacement current? 7. Write down any form of the flat wave electric field and determine the associated magnetic field. 8. Conducting and displacement currents - differences and occurrence in lossy and lossless media? 9. What is the difference between the wave form in the lossy and lossless medium? 10. Reflection coefficient and SWR. 11. Standing wave distribution - values and positions of minima and maxima. 12. When is the minimum and when the maximum distribution occurs at the border? 13. What is it and what is the use of quarter and half wave plates? 14. What is the characteristic impedance of the TEM line? 15. What is the waveguide cut-off frequency? What is the single-wave operation band in a waveguide? 16. How will the wavelength change when transitioning from TEM line to waveguide? 17. Arrange (and name) the first two modes of rectangular waveguide. 18. Matching system - single tuner 19. Matching system - L type system	
Work placement	Not applicable	