



Subject card

Subject name and code	Antenna Technique, PG_00050023						
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			Obligatory subject group in the field of study 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	2	ECTS credits			3.0		
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	prof. dr hab. inż. Włodzimierz Zieniutycz					
	Teachers	dr inż. Małgorzata Warecka prof. dr hab. inż. Włodzimierz Zieniutycz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45	8.0		22.0		75
Subject objectives	The aim of the course is to give the students the knowledge of theory, construction and measurement technique of antenna parameters taking into account the specifics the resulting from the applications in space and satellite technologies.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_U09	He can assess the suitability of numerical tools to design the selected antennas (e.g. microstrip, reflector antennas) and arrays used in space application.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information		
	K7_U12	He can simulate numerically electric parameters of selected antennas and arrays used in space application. He can design classical microstrip antenna using the suitable numerical tools.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
	K7_W12	Has knowledge on the specificity of the wireless channel used in space application			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	K7_U08	He can measure the electric parameters (e.g. radiation pattern, gain) of selected antennas and arrays used in space application.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	K7_W07	Has knowledge on the space specifics and its influence on the design, technology and measurement methods of electric parameters of the antennas and arrays operating in space.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		

Subject contents	<p>1. Introduction: electromagnetic frequency bands, basics of radiation theory and electromagnetic wave guiding, quantitative description of field phenomena.</p> <p>2. Antenna parameters: radiation pattern, gain, effective antenna aperture, polarization parameters, noise parameters.</p> <p>3. Theory of antenna array, the concept of array factor, , homogeneous and nonhomogeneous linear array, planar array, beam forming systems.</p> <p>4. Overview of selected types of antennas: dipoles and their power supply systems, biconical, helical, spiral antennas,tubes, microstrip antennas, slot, reflector antennas.</p> <p>5. Earthly space and space as a specific working environmentsfor antennas - factors determining the choice of material and the process of designing and antennas construction.</p> <p>6. Antenna measurement: environmental measurements, antenna parameters measurement: radiation pattern, gain, ellipticity, reflection.</p> <p>7. Final test</p>											
Prerequisites and co-requisites	Basic of electromagnetics											
Assessment methods and criteria	<table border="1" data-bbox="448 844 1489 949"> <thead> <tr> <th data-bbox="448 844 794 880">Subject passing criteria</th> <th data-bbox="794 844 1141 880">Passing threshold</th> <th data-bbox="1141 844 1489 880">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 880 794 909">written test from lecture</td> <td data-bbox="794 880 1141 909">50.0%</td> <td data-bbox="1141 880 1489 909">70.0%</td> </tr> <tr> <td data-bbox="448 909 794 949">reports from laboratory</td> <td data-bbox="794 909 1141 949">50.0%</td> <td data-bbox="1141 909 1489 949">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	written test from lecture	50.0%	70.0%	reports from laboratory	50.0%	30.0%
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reports from laboratory	50.0%	30.0%										
Recommended reading	Basic literature	<p>1. C. A. Balanis: Antenna Theory, Analysis and Design, John Wiley, 1982.</p> <p>2. W. A. Imbriale, S. Gao, L. Boccia: Space Antenna handbook, J. Wiley, 2012.</p> <p>3. W. Zieniutycz: Anteny - podstawy polowe, WKŁ, 2001 (in Polish)</p>										
	Supplementary literature	1. G. E. Evans: Antenna Measurement Techniques, Artech House, 1990										
	eResources addresses	Adresy na platformie eNauczanie: Technika antenowa (TKiS) - 23/24 - Moodle ID: 32035 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32035										
Example issues/ example questions/ tasks being completed	<p>1. Define the gain of antenna.</p> <p>2. The angular spectrum - discuss the application in antenna measurement.</p> <p>3. Discuss the properties of biconical antenna.</p> <p>4. Discuss the formula on reflector antenna directivity.</p>											
Work placement	Not applicable											