



Subject card

Subject name and code	Antenna Techniques, PG_00048083						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2026/2027		
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			1.0		
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					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15	1.0		9.0		25
Subject objectives	Presentation of antennas analysis tools, properties and parameters of typical antennas, methods of measurement of antenna's parameters						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study		Student has mastered basic theorems concerning antenna theory, knows the structure, properties and parameters of typical antennas as well as measurement methods of fundamental antenna parameters.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge	
	[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions		tudent has mastered to plan numerical simulations and experiments concerning antenna design and measurements			[SU3] Assessment of ability to use knowledge gained from the subject	

Subject contents	1. Introduction. Antenna parameters: pattern, directivity, gain. 2. Input impedance of antenna, radiation resistance. 3. Polarization parameters of antennas, noise in antennas. Antenna bandwidth. 4. Basic concepts: physical sources of the radiation field, magnetic current. 5. Equivalence principle, angular spectrum. 6. Near and far fields properties. 7. Uniform linear and planar antenna arrays: Array factor. 8. Antenna arrays with nonuniform amplitude distribution. Fourier and Woodward methods of array synthesis. Smart antennas. 9. Radiating elements: Hertz and magnetic dipoles, half-wave dipole. 10. Feeding structures, baluns. 11. Microstrip and slot antennas. 12. Traveling wave antennas: Yagi-Uda and helical antennas. 13. Frequency independent antennas: biconical, and spiral antenna. Log-periodic antennas. 14. Rectangular and circular apertures. 15. E-plane and H-plane sectoral horns, pyramidal and conical horns. 16. Reflector antennas. Directivity of parabolic reflector. 17. Lens antennas. 18. Antenna measurement: pattern, gain and polarization state measurements. 19. Final test.								
Prerequisites and co-requisites									
Assessment methods and criteria	<table border="1" data-bbox="451 624 1487 692"> <thead> <tr> <th data-bbox="451 624 798 658">Subject passing criteria</th> <th data-bbox="805 624 1141 658">Passing threshold</th> <th data-bbox="1149 624 1487 658">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 658 798 692">Midterm colloquia</td> <td data-bbox="805 658 1141 692">50.0%</td> <td data-bbox="1149 658 1487 692">100.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquia	50.0%	100.0%
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Recommended reading	Basic literature	1. C.A. Balanis: Antenna Theory Analysis and Design, John Wiley and Sons, 1982 2. W. Zieniutycz: Anteny, podstawy polowe, WKŁ, 2000 3. Stutzman W. L. , Thiele G. A.: Antenna Theory and Design, John Wiley New York, 1981							
	Supplementary literature	No requirements							
	eResources addresses	Adresy na platformie eNauczanie:							
Example issues/ example questions/ tasks being completed	1. Define the concept of an equivalent problem due to the external field. 2. Discuss the properties of the electromagnetic field in the far field zone. 3. Discuss the construction of planar version of Marchand balun. 4. Discuss the amplitude and phase distributions in parabolic antenna aperture.								
Work placement	Not applicable								

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