



Subject card

Subject name and code	Antennas and Radiowave Propagation, PG_00047904						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2022/2023		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Radiocommunication Systems and Networks -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Sławomir Ambroziak				
	Teachers		dr hab. inż. Sławomir Ambroziak dr hab. inż. Rafał Lech mgr inż. Sebastian Dziedziewicz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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		2.0		18.0	50
Subject objectives	Knowledge of basic antenna parameters and antenna interface activity between wire and wireless part of radio-link. Knowledge of main factors influencing on the radio signal attenuation in propagation environment content with range of the radio section						
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		He can determine the attenuation of the radio channel and select the parameters of the antenna. The student learned the basics of radio wave propagation mechanisms as well as antenna theory and technique		[SW3] Assessment of knowledge contained in written work and projects		
	[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn		Student has mastered the skill of independent design of a radio link		[SU4] Assessment of ability to use methods and tools		

Subject contents	1 Antenna in communication system, Friis equation, antennas classification and application 2 Field and circuit antenna parameters, bandwidth, mechanical properties 3 Linear, wire antenna, half-wavelength dipole, cylindrical dipole. Travelling wave antennas: helical antenna, Yagi-Uda antenna. Matching and balancing of antenna, design and application principles 4 Horns: construction, properties and application. 5 Reflector and parabolic antennas. Principles of operation, designing, applications. 6 Basic elements of the planar antenna technique: microstrip and slot antennas. 7 Antenna arrays, array factor, properties, antenna measurements. 8 Basic principles of radio waves propagation. Free space propagation. Fresnel zones 9 Over ground and open space waves. Absorption and reflection phenomena's 10 Troposphere propagation medium. Refraction and scattering in tropo-sphere 11 Statistical description of the radio wave propagation loss 12 Ionosphere propagation medium. MUF, LUF and FOT frequencies 13 Propagation loss in real medium. Terrain aspects 14 Propagation loss modeling. Open, outdoor and indoor conditions 15 Exams		
Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	50.0%	70.0%
	Project	50.0%	30.0%
Recommended reading	Basic literature	1. Morawski and W. Gwarek: Teoria pola elektromagnetycznego, WNT, 1985. 2. C.A. Balanis: Antenna Theory Analysis and Design, John Wiley and Sons, 1982. 3. Katulski R.J.: Propagacja fal radiowych w telekomunikacji bezprzewodowej, WKŁ, 2009 4. D. J. Bem: Anteny i rozchodzenie się fal radiowych, WNT, 1973. 5. W. Zieniutycz: Anteny, podstawy polowe, WKŁ, 2000.	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	No requirements		
Work placement	Not applicable		