GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of Telecommunications, PG_00047913		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Teleinformation Networks -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Bartosz Czaplewski	
	Teachers	dr inż. Bartosz Czaplewski	

Lesson types and methods of instruction							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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	4.0	51.0	100

Subject objectives	Acquaintance students with principles of modern telecommunication systems.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U07] can apply methods of process and function support, specific to the field of study	Student is able to solve problems using the abilities from his study	[SU3] Assessment of ability to use knowledge gained from the subject
	[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	The student is able to make the critical analysis of basic problems which arrive in telecommunications systems	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
	[K6_W34] Knows the characteristics of telecommunications channels, methods of securing information, modulation systems, methods of access to the channel.	Student knows types of communications channels, their properties and methods of protecting information. Student is able to formulate solutions to basic problems connected with the information transfer through communication channels and networks	[SW1] Assessment of factual knowledge
	[K6_U31] can identify telecommunications network architectures, differentiates their areas and functional elements, evaluates the quality of service delivery, calculates parameters of functional elements	Student knows kinds and the structure of communication networks as well as services provided by them and is able to conduct their analysis	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
	[K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n	Student is able to formulate solutions to basic problems connected with the information transfer through communication channels and networks	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information

Subject contents	1. Information sources, classification, analog and digital sources, examples 2. Properties of information sources and their models 3. Analog signal and its dependence on information. Description of analog signals in time and frequency domain. Power, energy, spectrum density and frequency band of signals. Logarithmic measures of signal level and signal power. 4. Techniques for signal transmission over telecommunication links. Transmission media and their characteristics, copper, coaxial and fiber cables, radio diffusion. Baseband and band-pass transmission. 5. Characteristics of telecommunication links, wired, wireless and optical links. Symbolic designations. 6. Telecommunication system, transmitter and receiver functions. Open loop and closed loop system, examples. 7. Analog telecommunication channels, their types and characteristics, examples. 8. Noise, disturbances, echos and crosstalks. Linear and nonlinear distortions, their reasons and properties. 9. Modulation and its need. Analog modulation and demodulation. Amplitude and angle modulation. Synchronous and asynchronous demodulation 10. Pulse modulations, PAM, PWM, PPM, reconstruction of modulating signal 11. Conversion of analog signals into digital form, Sampling and quantizing effects, quantization noise. PCM principle. Companding characteristics. 12. The concept of a digital signal, description of digital signals in the time and frequency domains, binary and multivalued signals, bit and symbol rate. 13. Baseband digital signal transmission, receiver model, noise influence, error probability. 14. Intersymbol interference, Nyquist filter and Nyquist criteria, matched filtering, eye diagram. 15. Models of digital channels, measures of channel quality, channel bandwidth, Shannon theorem on channel bandwidth. 16. Pulse regeneration, regenerator functions. 17. Pulse-code modulation PCM, DPCM. 18. Source coding, source entropy, source information efficiency, Shannon theorem on source coding. 19. Data compression, lossy and lossless compression, Huffman encoding, RLE encoding, dictionary compression methods, JPEG, MPEG and MP3 standards. 20. Channel coding: detection and correction coding, classification of channel codes, block codes, Hamming code, cyclic codes, convolutional codes. 21. Line coding, NRZ-L, NRZ-M, NRZ-S, RZ, AMI codes, Manchester code, HDB3 code. 22. Digital modulations of carrier signal, ASK, PSK, FSK, QPSK, M-QPSK.

	23. Multiple access methods, multiple access vs. multiplexing, TDMA, FDMA, CDMA, SDMA. 24. Broadband systems with spread spectrum (Direct Sequence, Frequency Hopping) and Ultra Wide Band systems.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture: 2 tests	50.0%	60.0%
Practice: all laboratory exercises attested	50.0%	40.0%

Recommended reading	Basic literature	Lathi B.P.: Modern Digital and Analog Communication Systems , Oxford University Press, 2009
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	