



## Subject card

Subject name and code	Telecommunications, PG_00046328						
Field of study	Electronics and Telecommunications, Informatics, Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2021/2022		
Education level	second-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	1	Language of instruction			English		
Semester of study	1	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
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 hab. inż. Sławomir Ambroziak mgr inż. Jacek Litka dr inż. Bartosz Czaplewski dr inż. Wojciech Siwicki				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	20.0	0.0	0.0	40
	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	40		17.0		68.0	125
Subject objectives	Acquainting with the basics of operation of modern telecommunications systems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions		Student identifies, classifies and describes the basic concepts, problems and challenges of the area telecommunications.		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information		
	[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.		Student identifies, classifies and describes the basic concepts, problems and challenges of the area telecommunications.		[SW1] Assessment of factual knowledge		

Subject contents	<p>Lecture:</p> <ol style="list-style-type: none"> <li>1. Basic concepts: telecommunications, information, information sources, signal, telecommunications service, telecommunications system, telecommunications channel, telecommunications network.</li> <li>2. The telecommunications system and functions of its elements; open and feedback system.</li> <li>3. Description of analog signals in the domain of time and frequency; logarithmic measures of the signal level.</li> <li>4. Transmission media (open space, conductive lines, optical fiber) and their parameters; transmission of signals in the base band and in the higher frequency band.</li> <li>5. Analog modulation and demodulation; modulation of amplitude, frequency and phase; synchronous and asynchronous demodulation.</li> <li>6. Disturbances (noise, crosstalk, echo, multi-path) and distortions (linear and non-linear); reasons for their formation and general properties.</li> <li>7. Processing analog signals into digital form; sampling, quantization, coding.</li> <li>8. Quantization noise, compression and speech signal expansion.</li> <li>9. Source coding, source entropy, lossy and lossless compression; classification of coding and compression methods.</li> <li>10. Telecommunication channel: analogue, digital; properties, interference and distortion, channel capacity, Shannon's theorem.</li> <li>11. Transmission of digital signals in the basic band; transmission codes and their properties.</li> <li>12. Channel and corrective coding, detection and correction of errors.</li> <li>13. Multiplexing as a technique for maximizing the use of transmission resources; multiplexing: FDM, TDM, WDM, CDM and SDM.</li> <li>14. ISO / OSI layered model of equipment and systems cooperation; application of this model in telecommunications.</li> <li>15. Telecommunications network (fixed and mobile subscribers); structure and functional elements; classification of services.</li> <li>16. Connecting process; channel switching and packet switching.</li> <li>17. Service request process for both fixed and mobile subscribers.</li> <li>18. Access networks and core networks.</li> <li>19. The evolution of the Internet network to the operator's network of telecommunications services.</li> <li>20. Next generation networks - NGN and NGL.</li> </ol> <p>Laboratory:</p> <ol style="list-style-type: none"> <li>1. Pulse code modulation (PCM).</li> <li>2. Properties of selected transmission lines.</li> <li>3. Transmission codes and modulations.</li> <li>4. Detection and correction of errors in digital systems.</li> <li>5. Sampling, quantization and compression, and sound and image quality.</li> <li>6. Interfaces and access to the telecommunications network.</li> </ol>																	
Prerequisites and co-requisites																		
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1055 794 1084">Subject passing criteria</th> <th data-bbox="799 1055 1137 1084">Passing threshold</th> <th data-bbox="1142 1055 1481 1084">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1090 794 1120">Laboratory - part 1</td> <td data-bbox="799 1090 1137 1120">50.0%</td> <td data-bbox="1142 1090 1481 1120">20.0%</td> </tr> <tr> <td data-bbox="456 1126 794 1155">Laboratory - part 2</td> <td data-bbox="799 1126 1137 1155">50.0%</td> <td data-bbox="1142 1126 1481 1155">20.0%</td> </tr> <tr> <td data-bbox="456 1162 794 1191">Lecture - part 1</td> <td data-bbox="799 1162 1137 1191">50.0%</td> <td data-bbox="1142 1162 1481 1191">30.0%</td> </tr> <tr> <td data-bbox="456 1198 794 1227">Lecture - part 2</td> <td data-bbox="799 1198 1137 1227">50.0%</td> <td data-bbox="1142 1198 1481 1227">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory - part 1	50.0%	20.0%	Laboratory - part 2	50.0%	20.0%	Lecture - part 1	50.0%	30.0%	Lecture - part 2	50.0%	30.0%
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Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1.Lathi B.P.: Modern Digital and Analog Communication Systems, Oxford University Press, 2009</li> <li>2.Sklar B.: Digital Communications, Pearson Educations, 2001</li> <li>3.Schneier B.: Applied Cryptography: Protocols, Algorithms, and Source Code in C, 1996</li> </ol>																
	Supplementary literature	<ol style="list-style-type: none"> <li>1.Zalecenia ITU-T</li> <li>2.S.Kula: Systemy i sieci dostepowe xDSL, WKŁ, Warszawa 2009</li> <li>3.J. Fridrich, Steganography in Digital Media: Principles, Algorithms, and Applications, Cambridge University Press, 2010</li> </ol>																
	eResources addresses																	
Example issues/ example questions/ tasks being completed	none																	
Work placement	Not applicable																	