



Subject card

Subject name and code	Information Systems Fundamentals, PG_00048119						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
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	5	ECTS credits			4.0		
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 inż. Maciej Sac dr inż. Bartosz Czaplewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	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	Familiarizing students with the basic issues of information theory describing theoretical basis for the modeling and analysis of the information system and with the key principles of coding theory which specifies design methods of functional elements of an information system.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	Determines Huffman code and constructs Hamming codewords. Uses polynomial codes. Decodes selected redundant block codes. Demonstrates arithmetic coding. Calculates the information capacity of the symbol transmitted through the channel.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K6_W35] Knows the concepts of the technique of signal transmission, operation of telecommunications networks and multimedia services and the rules for providing them	Describes digital channel models. Explains the principles of information systems with feedback channel.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_W34] Knows the characteristics of telecommunications channels, methods of securing information, modulation systems, methods of access to the channel.	Defines and knows the differences between source and channel coding. Defines polynomial and cyclic codes. Describes the encoding and decoding of convolutional codes.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		

Subject contents	<p>1. Information system - basic concepts and definitions.2. Basic concepts of information theory.3. Introduction to source coding.4. Single message encoding.5. Shannon theorem on source coding. Message group coding.6. Arithmetic coding.7. Description of digital channels and their basic types. Discrete channel capacity.8. The elementary error rate and the Gilbert model.9. Information capacity of the analog channel. Theorem on channel coding.10. Linear block codes. Detection and correction capabilities of codes.11. Principles of Hamming code coding.12. General principles of optimal decoding for linear codes. Linear block code syndrome.13. Codes modifications. Dual codes.14. Elements of polynomial algebra for ratio coding.15. Definition of polynomial codes and coding based on generating polynomials.16. Matrices generating quotient codes and their relations with generator polynomials.17. Cyclic codes.18. Decoding for polynomial codes, in particular cyclic codes.19. Detection and correction of burst errors.20. Convolutional codes. Convolutional code description methods.21. Sequential and Viterbi decoding.22. Lattice codes, especially the Ungerboeck code.23. Feedback as a tool to improve the quality of information transmission; systems with information and decision feedback. ARQ systems.24. Types of errors in systems with feedback and assessment of feedback channel quality.25. Examples of advanced channel codes: turbo codes, LDPC codes, fountain codes, polar codes, etc.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	50.0%
	Midterm colloquium	50.0%	50.0%
Recommended reading	Basic literature	<p>1. Krzysztof Wesołowski, Podstawy cyfrowych systemów telekomunikacyjnych, Wydawnictwa Komunikacji i Łączności WKŁ, 2003.2. Simon Haykin, Systemy telekomunikacyjne, Wydawnictwa Komunikacji i Łączności WKŁ, 2004.</p>	
	Supplementary literature	<p>1. Jerzy Siedler, Systemy przesyłania informacji cyfrowej, Wydawnictwo Naukowo-Techniczne, 1972.2. David J.C. MacKay, Information Theory, Inference, and Learning Algorithms, Cambridge University Press, 2003.</p>	
	eResources addresses	<p>Adresy na platformie eNauczanie: Podstawy systemów informacyjnych - 2023/24 - Moodle ID: 28823 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=28823</p>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		