GDAŃSK UNIVERSITY OF TECHNOLOGY

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	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 polinomial 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.
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	1. Krzysztof Wesołowski, Podstawy cyfrowych systemów telekomunikacyjnych, Wydawnictwa Komunikacji i Łączności WKŁ, 2003.2. Simon Haykin, Systemy telekomunikacyjne, Wydawnictwa Komunikacji i Łączności WKŁ, 2004.
	Supplementary literature	1. Jerzy Siedler, Systemy przesyłania informacji cyfrowej, Wydawnictwo Naukowo-Techniczne, 19722. David J.C. MacKay, Information Theory, Inference, and Learning Algorithms, Cambridge University Press, 2003.
	eResources addresses	Adresy na platformie eNauczanie: Podstawy systemów informacyjnych - 2023/24 - Moodle ID: 28823 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28823
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	