GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056004		
Field of study	Technical Physics		
Date of commencement of studies	October 2020	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	4	Language of instruction	Polish Polish
Semester of study	7	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Atomic, Molecular and Optical Physics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Maciej Demianowicz	
	Teachers	dr hab. inż. Maciej Demianowicz	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

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	15	0.0	0.0	15

Subject objectives

Introduction to information theory.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U08	The student has the ability to prepare written works.	[SU1] Assessment of task fulfilment
K6_U10	The student chose this course, which already proves his well-defined interests.	[SU1] Assessment of task fulfilment
K6_W02	The student has in-depth and structured knowledge of the basics of classical information theory and knows how to apply it to selected problems in physics and technology.	[SW1] Assessment of factual knowledge
K6_K05	The student is able to communicate the effects to a wider group.	[SK1] Assessment of group work skills
K6_U07	The student is able to convey knowledge in a popular science manner.	[SU1] Assessment of task fulfilment

Subject contents	What is information theory. Information. Axiomatic approach to uncertainty measure Shannon entropy Joint entropy. Conditional entropy. Mutual information Mutual information vs. conditional entropy Relative entropy Jensen's inequality Data processing inequality Noiseless coding Unique decipherability. Prefix codes. Kraft inequality Noiseless coding theorem Optimal coding. Shannon code. Shannon-Fano code. Arithmetic coding. Huffman code Information sources. Asymptotic equipartition property Data compression Information channel. Channel capacity The channel coding theorem Error correction codes. Hamming codes
Prerequisites and co-requisites	Basic knowledge of the probability calculus.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test	50.0%	100.0%

Recommended reading

Basic literature	T. M. Cover, J. A. Thomas, Elements of information theory (Wiley, New York, 1991). R. B. Ash Information theory (Dover, 1990)
Supplementary literature	N. Abramson, Information theory and coding (McGraw-Hill) A. A. Bruen, M. A. Forcinito, Cryptography, information theory, and error-correction (Wiley, 2005)

	eResources addresses	Adresy na platformie eNauczanie: Wstęp do teorii informacji - Moodle ID: 34708 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34708
Example issues/ example questions/ tasks being completed	Properties of the Shannon entropy. Properties of the mutual information Construct a Huffman code. Computing channel capacity	
Work placement	Not applicable	