

GDAŃSK UNIVERSITY

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						ematics		
Name and surname	Subject supervisor		dr hab. inż. Maciej Demianowicz						
of lecturer (lecturers)	Teachers		dr hab. inż. Maciej Demianowicz						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	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 classes includ plan	n didactic led in study	Participation in consultation hours		Self-study		SUM	
	Number of study hours	15		0.0		0.0 1		15	
Subject objectives	Introduction to inform	ation 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. N							
	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							
	The channel coding theorem	The channel coding theorem						
	Error correction codes. Hamming codes							
Prerequisites and co-requisites	Basic knowledge of the probability calculus.							
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade					
and criteria	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	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			