GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Intelligence and Human Cognitive Systems, PG_00067973		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional subject group Humanistic-social 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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Multimedia Systems -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Karolina Marciniuk	
	Teachers	dr inż. Karolina Marciniuk	

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	1.0	9.0	25

Subject objectives

This interdisciplinary course combines knowledge from psychology, computer science and audio and video engineering. It aims to provide an understanding of digital audio and video processing in the context of human environmental perception and decision-making. Participants will gain an understanding of both human cognitive processes and their digital realisations.
The course will cover:
- Tthe basics of human information processing and its impact on decision-making;
- Modern digital signal processing techniques and their application in information retrieval;
- Analogies between human cognitive processes and digital methods of information processing.

Participants will develop the ability to understand and analyse basic cognitive processes, as well as apply digital signal processing techniques in practice.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K02] is ready to critically assess possessed knowledge and acknowledge the importance of knowledge in solving cognitive and practical problems	The student is able to critically evaluate various cognitive models and theories, comparing them with actual human cognitive processes. The student is able to analyse and evaluate methods of digital processing of sound and image signals, taking into account their practical applications and relative advantages and disadvantages. The student is then able to apply the knowledge acquired to solve specific problems.	[SK2] Assessment of progress of work
[K6_K01] is ready to cultivate and disseminate models of proper behaviour in and outside the work environment; make independent decisions; critically evaluate actions of their own, teams they lead and organisations they are part of; take responsibility for results of these actions; responsibly perform professional roles, including:n - observing rules of professional ethics and require it from others,n - care for the achievements and traditions of the professionn	Students are able to recognize and discuss the ethical and social implications of the use of digital cognitive systems, critically assessing their impact on society and individual users.	[SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work

Subject contents

Module 1: Introduction to Human Intelligence and Cognitive Systems
- Course objectives and structure
- Basic concepts in cognitive psychology
- Perception, attention, memory, thinking.
- Sound and image perception - color vision, theories of hearing
- Human cognitive models vs. digital models of perception
- Analogies between cognitive processes and digital systems

Module 2: Signal Processing
- Modes of information acquisition - acquisition of audio and video signals.
- Digital form of signals and basic operations on signals.

Module 3: Application areas
- Implementation for speech signal - analysis, synthesis.
- Recognition of the environment on the basis of vision and/or sound.
- Methods for detecting interference with audio and video signals.
- Ethical and legal challenges.

Prerequisites and co-requisites

Knowledge of the basics of programming, signal representation and signal processing.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
report	50.0%	30.0%
validation test	50.0%	70.0%

Recommended reading	Basic literature	Havelock, David Ian, Sonoko Kuwano, and Michael Vorländer, eds. Handbook of signal processing in acoustics. Vol. 1. New York: Springer, 2008. Müller, Nicolas M., Karla Pizzi, and Jennifer Williams. "Human perception of audio deepfakes." Proceedings of the 1st international workshop on deepfake detection for audio multimedia. 2022.Lemaitre, Guillaume, Nicolas Grimault, and Clara Suied. "Acoustics and psychoacoustics of sound scenes and events." Computational analysis of sound scenes and events (2018): 41-67. Everest, F. Alton. Master handbook of acoustics. 2022. Lemaitre, Guillaume, Nicolas Grimault, and Clara Suied. "Acoustics and psychoacoustics of sound scenes and events." Computational analysis of sound scenes and events (2018): 41-67. Sharma, Shanu, Priya Ranjan, and Amit Ujlayan. "An Exploration in Perception-Based Digital Media Processing: A Psychological Perspective." Advances in Communication, Cloud, and Big Data: Proceedings of 2nd National Conference on CCB 2016. Springer Singapore, 2019. Sathian, Krishnankutty, and Vilayanur S. Ramachandran, eds. Multisensory perception: From laboratory to clinic. Academic Press, 2019. Thompson, William, et al. Visual perception from a computer graphics perspective. CRC press, 2011.
	Supplementary literature	Kahneman, Daniel, Piotr Szymczak, and Amos Tversky. Pułapki myślenia: o myśleniu szybkim i wolnym. Poznań: Media Rodzina, 2019. International Workshop on Human and Machine Perception, and V Cantoni. Human and Machine Perception 3: Thinking, Deciding and Acting / Edited by Virginio Cantoni [and Three Others]. Ed. by V. Cantoni. 1st ed. 2001. New York, New York State: Kluwer Academic Publishers, 2001. Web
	eResources addresses	
Example issues/ example questions/ tasks being completed	according to lecture topics	
Work placement	Not applicable	

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