



Subject card

Subject name and code	Data collection and analysis, PG_00069090						
Field of study	Technical Physics, Materials Engineering, Mathematics, Materials Engineering, Nanotechnology, Nanotechnology, Materials Engineering						
Date of commencement of studies	October 2025	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			1.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Division of Theoretical Physics and Quantum Informaton -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Bartosz Reichel				
	Teachers		dr inż. Bartosz Reichel				
Lesson types	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		2.0		8.0	25
Subject objectives	The aim of the course is to familiarize students with methods of data acquisition, particularly from physical and hardware systems, as well as with the fundamentals of data storage, processing, and analysis. The course covers communication with devices (serial interfaces and transmission protocols), data acquisition (video, location, and streaming data), organization and optimization of data storage (file systems, SQL/ NoSQL databases), and data processing in distributed and IoT environments. It also introduces methodologies for conducting analytical projects, data preparation techniques, and selected classical and machine learning methods. The objective is to develop the ability to design simple data acquisition systems and appropriately select data analysis methods.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_K101] acknowledges the importance of knowledge related to the field of study in solving cognitive and practical problems, critically assessing the information obtained		The student is able to critically evaluate new data collection methods. Is able to adapt methods to new environmental conditions.		[SK2] Assessment of progress of work		
	[K7_U101] is able to formulate complex research problems and adopts appropriate methods, obtaining innovative solutions, cooperating with other people, both as a leader and a team member		Is able to select appropriate methods of analysis and data collection for the phenomenon under study. Is able to organize research work/procedure.		[SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_W101] is able to make an in-depth identification of key objects and phenomena related to the field of study, as well as theories that describe them and applicable analytical and design methods		The student knows the methods of collecting data and understands their physical aspect. Knows how to use selected methods in the environmental context.		[SW1] Assessment of factual knowledge		

Subject contents	<p>Course content – lecture The main goal of the course is to introduce students to data mining and data analysis. The course will provide examples of real-world problems in the fields of business, medicine and IT.</p> <p>They will be presented to the processes of collecting and recording data encountered in practice-row data collection video, audio, data transferred via serial interfaces, data acquisition cards.</p> <ol style="list-style-type: none"> 1. Video data collection 2. Serial interfaces: UART, USB, Ethernet 3. Mapped files, blocking 4. Database SQL / NoSQL, storage optimization 5. Collecting data about web user behavior 6. Collecting data about the user's location <p>7. Streaming (eg Apache Kafka)</p> <p>8. MQTT as a data collection control protocol for IoT, MQTT Brokers</p> <p>Emphasis will be placed on how to solve real problems during analytical process. Scope of the course includes:</p> <ol style="list-style-type: none"> 1. Data analysis as a process. Data mining methodologies. 2. Data preparation. 3. Classification techniques: Naïve Bayes classifie, k-NN 4. Regression methods 5. Classification and regression trees. Optimalization. <p>6. Assessing and comparing models performance</p> <p>7. Machine learning methods, types of layers in neural networks.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Egzam	60.0%	100.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. D. Hand, H. Mannila, P. Smyth, Principles of data mining, MIT Press, 2001 2. F. Provost, T. Fawcett, Data science for business, OReilly Media, 2013 	
	Supplementary literature	J.Axelsson, Serial Port Complete: COM Ports, USB Virtual COM Ports, and Ports for Embedded Systems (Complete Guides series), 2007, Lakeview Research	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>Implementation of the circular buffer.</p> <p>Describe the process for data warehouse ETL?</p>		
Practical activites within the subject	Not applicable		

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