



Subject card

Subject name and code	Database Systems, PG_00038295						
Field of study	SYSTEMY BAZ DANYCH						
Date of commencement of studies	February 2025		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Robert Smyk				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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		7.0		48.0	100
Subject objectives	The aim of the "Database Systems" course is to develop students' skills in designing, using, and managing relational databases and extracting knowledge from them using SQL and selected data mining methods. In this course, students: learn the principles of database management systems (DBMS) and best practices for their use, acquire the ability to formulate queries in SQL, including both basic operations (SELECT, INSERT, UPDATE, DELETE) and complex operations (joins, subqueries, aggregations, views), learn basic data mining methods and how to apply them to the analysis of data stored in databases, learn to practically use database management tools and methods to solve common IT and business problems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W05] has knowledge of artificial intelligence computing techniques, inference, learning and solution-finding methods in algorithmic terms applied to automation and robotics systems	Possesses knowledge of data mining techniques and selected algorithmic inference and learning methods that use data collected in database systems in applications to automation and robotics systems.	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
	[K7_W02] has a structured knowledge of the application of information systems to improve the reliability, efficiency, speed and mobility of control and management systems	Possesses structured knowledge of the use of database systems and SQL to increase the reliability, efficiency, speed and mobility of control and management systems.	[SW2] Ocena wiedzy zawartej w prezentacji
	[K7_K06] is aware of the impact of engineering activities on the quality of applied solutions and the environment	Is aware of the impact of the design and operation of database systems on the quality of IT solutions and the responsible and secure use of data.	[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce
	[K7_U10] is able to apply the known mathematical tools and methods and computer techniques to analyse and evaluate automation and robotics components, devices, systems and systems	Is able to use database system tools and SQL language to analyze, process and evaluate data from automation and robotics components, devices and systems.	[SU4] Ocena umiejętności korzystania z metod i narzędzi
	[K7_U07] is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems in the field of automation and robotics	Is able to use SQL queries and data analysis and exploration methods in database systems to formulate and solve engineering tasks and simple research problems in the field of automation and robotics.	[SU1] Ocena realizacji zadania

Subject contents	Course content – lecture Introduction to Database Systems Concepts: Data, Information, Database, DBMS Data Models (Especially the Relational Model) Relational Database Design Tables, Keys, Relationships Basic Normalization SQL Language Basics Defining Structures (CREATE / ALTER / DROP) Basic Data Operations (SELECT, INSERT, UPDATE, DELETE) SQL Language Complex Queries Joining Tables (JOIN) Data Aggregation (GROUP BY, HAVING) Subqueries, Views Database Management Users, Permissions Backups, Basic Query Optimization Data Mining in Databases Preparing Data for Analysis Examples of Data Analysis/Mining Techniques Using SQL Examples of Applications in Automation and Robotics Storing Measurement and Diagnostic Data Simple Analysis supporting the control and supervision of systems. Course content – laboratory DBMS Environment and SQL Basics DBMS Installation/Login Creating a Simple Database and Tables (CREATE TABLE) Simple SELECT and WHERE Queries Database Schema Modeling and Creation Designing a Simple Data Model (e.g., a Measurement System, a Parts Warehouse) Defining Primary and Foreign Keys Introducing Constraints (NOT NULL, UNIQUE, CHECK) Data Modification Operations Inserting Data (INSERT) Modifying (UPDATE) and Deleting (DELETE) ROLLBACK/COMMIT Transactions and Simple Examples Compound Queries and Table Joins Various JOIN Types (INNER, LEFT, RIGHT) Data Aggregation (COUNT, SUM, AVG, GROUP BY, HAVING) Subqueries Views, Indexes, and Optimization Basics Creating and Using Views (VIEW) Creating indexes and observing the impact on query times Analyzing the query execution plan (EXPLAIN) Permissions and data security Creating users Granting and revoking privileges (GRANT, REVOKE) Examples of access control for selected tables/views Data exploration from SQL Preparing measurement data (cleaning, filtering, aggregation) Simple analyses: detecting outliers, comparing measurement series Exporting query results for further analysis (e.g., CSV) Mini-laboratory project Designing and implementing a small database for a selected automation/robotics system Preparing a set of analytical queries to support system diagnostics or monitoring.											
Prerequisites and co-requisites	Knowledge of computer science at an engineering level.											
Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Exercises</td><td>50.0%</td><td>60.0%</td></tr><tr><td>Egzamin</td><td>50.0%</td><td>40.0%</td></tr></table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Exercises	50.0%	60.0%	Egzamin	50.0%	40.0%
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Recommended reading	Basic literature	1. R. Elmasri, S.B. Navathe <i>Wprowadzenie do systemów baz danych</i>, wyd. VII, Helion, 2019. (helion.pl) 2. J. Dulek (lub inni autorzy polscy) <i>Bazy danych. Teoria i praktyka. Podręcznik dla studentów uczelni wyższych</i>, Wyd. KUL. (Wydawnictwo KUL) 3. A. Beaulieu <i>Wprowadzenie do SQL. Jak generować, pobierać i obsługiwać dane</i>, wyd. III (polskie tłumaczenie). (Tania Książka)										

	Supplementary literature	1. H. Garcia-Molina, J.D. Ullman, J. Widom <i>Systemy baz danych. Kompletny podręcznik</i> (Database Systems: The Complete Book). (Lubimyczytać) 2. M. Chałon <i>Systemy baz danych</i> (skrypt akademicki, dostępny online w formacie PDF). (Dolnośląska Biblioteka Cyfrowa) 3. Wybrane materiały dydaktyczne uczelni (skrypty, prezentacje, dokumentacja systemów SZBD, np. MySQL / PostgreSQL / SQL Server).
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Omów główne zadania systemu zarządzania bazą danych (SZBD) oraz jego podstawowe składniki. Discuss the main tasks of a Database Management System (DBMS) and its key components. 2. Wyjaśnij pojęcia: klucz główny, klucz obcy, integralność referencyjna. Podaj przykładowe definicje tabel w SQL, w których wykorzystasz te pojęcia. Explain the concepts of: primary key, foreign key, and referential integrity. Provide example SQL table definitions that use these concepts. 3. Opisz proces normalizacji bazy danych i wyjaśnij różnicę między 1NF, 2NF oraz 3NF. Describe the database normalization process and explain the difference between 1NF, 2NF, and 3NF. 4. Napisz przykładowe zapytanie SQL, które pobierze dane z dwóch tabel połączonych relacją (JOIN), z zastosowaniem warunku filtrowania oraz agregacji (GROUP BY). Write an example SQL query that retrieves data from two related tables using a JOIN, including a filtering condition and aggregation with GROUP BY. 5. Wyjaśnij, czym jest transakcja w systemie baz danych oraz omów właściwości ACID. Podaj przykład sytuacji, w której użycie transakcji jest konieczne. Explain what a transaction is in a database system and describe the ACID properties. Give an example of a situation where using a transaction is necessary. 6. Omów rolę indeksów w relacyjnych bazach danych. Jakie są zalety i potencjalne wady stosowania indeksów? Discuss the role of indexes in relational databases. What are the advantages and potential disadvantages of using indexes? 7. Opisz, w jaki sposób za pomocą języka SQL można przygotować dane do podstawowej eksploracji danych (np. czyszczenie, filtrowanie, agregacja). Describe how SQL can be used to prepare data for basic data exploration (e.g., cleaning, filtering, aggregation). 8. Podaj przykład zastosowania systemu baz danych w systemach automatyki lub robotyki oraz opisz, jakie korzyści daje wykorzystanie bazy danych w tym kontekście. Give an example of how a database system can be used in automation or robotics systems and describe the benefits of using a database in this context.	
Practical activities within the subject	Not applicable	

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