DESCRIPTION OF THE COURSE OF STUDY

Course code	**0719-2ID-C34-BD**	
Name of the course in	Polish	**Bazy danych**
	English	**Databases**

1. LOCATION OF THE COURSE OF STUDY within the system of studies

1.1. Field of study	Data engineering
1.2. Mode of study	Undergraduate engineering study
1.3. Level of study	First-cycle engineering
1.4. Profile of study*	General academic
1.5. Person/s preparing the course description	Mgr Dariusz Pasieka
1.6. Contact	dariusz.pasieka@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE course of study

2.1. Language of instruction	Polish
2.2. Prerequisites*	Mathematics Discrete mathematics Introduction to programming

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. **Form of classes**		Lectures, laboratories, project
3.2. **Place of classes**		Courses in the UJK teaching rooms of the Faculty of Physics
3.3. **Form of assessment**		Lectures – exam Laboratories – graded credit Project – graded credit
3.4. **Teaching methods**		Verbal, visual, practical
3.5. **Bibliography**	**Required reading**	1. Danuta Mendrala, Marcin Szeliga „Praktyczny kurs SQL. Wydanie III”, Helion 2015 2. Alan Beaulieu „Wprowadzenie do SQL. Jak generować, pobierać i obsługiwać dane. Wydanie III”, Helion 2021
	Further reading	1. Ramez Elmasri, Shamkant B. Navathe „Wprowadzenie do systemów baz danych. Wydanie VII”, Helion 2019

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives *(including form of classes)*

Lectures

C1. To acquire knowledge of the fundamental concepts of relational databases, including their structure, operations, and integrity constraints.
C2. To understand principles of data modeling, normalization, and transformation of entity structures into relational database schemas.
C3. To acquire knowledge on data storage organization, file organization types, and indexing methods.
C4. To understand transaction and concurrency management mechanisms and recovery methods for restoring consistent database states.

Laboratories

C1. To develop practical skills in using SQL for data operations, including queries, subqueries, and the use of row and aggregate functions.
C2. To master DML and DDL for managing data and database structures.
C3. To gain skills in defining procedures, functions, and triggers.

Project

C1. To develop teamwork skills in the process of designing a relational database.
C2. To understand the responsibility of an engineer in designing and managing databases, considering their integrity and efficiency.

4.2. Detailed syllabus *(including form of classes)*

Lectures

1.Introduction to relational databases: structure, basic operations, and integrity constraints.
2. Data modeling: entity structure and transformation into relational database schemas.

3. Database normalization: decomposition of relation schemas to eliminate undesired properties.
4. Data organization: storage structures, record organization within blocks, file organization types (unordered, ordered, hashed).
5. Data indexing: basic concepts and index structures (primary, clustered, secondary, sparse, dense) and dynamic multilevel indexes (ISAM, B+-tree).
6. Database transactions: properties, transaction execution models (sequential, concurrent), transaction scheduling.
7. Concurrency control algorithms: locking, two-phase locking, deadlock management, hierarchical locking, time-stamp-based methods, optimistic algorithms.
8. Database recovery: failure models, recovery mechanisms (WAL strategy, Rollback and Roll Forward), recovery module architecture and log files.

Laboratories

1. Syntax and basic SQL operations.
2. Row and aggregate functions for data analysis.
3. Creating queries combining data from multiple relations.
4. Structure and application of nested queries (subqueries).
5. DML: inserting, modifying, and deleting data in relations.
6. DDL: creating, modifying, and deleting relations, indexes, and views.
7. Procedures, functions, and triggers in databases.

Project

1. Students work in teams to design a relational database reflecting real-world structures.

4.3 Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
	within the scope of **KNOWLEDGE:**	
W01	knows the concepts and methods related to database system design, including their structure, organization, and optimization.	ID1A_W07 ID1A_W09
W02	knows methods and tools used for solving engineering tasks in the field of databases.	ID1A_W12
	within the scope of **ABILITIES:**	
U01	can retrieve information from literature and databases, analyze it, and interpret results.	ID1A_U06 ID1A_U11
U02	can design and implement database systems, selecting appropriate programming tools, including their structure and transactions.	ID1A_U06 ID1A_U11
U03	can assess the usefulness of methods and tools for solving complex database problems and select the most effective solutions.	ID1A_U06 ID1A_U11
U04	can carry out a project in a team.	ID1A_U13
	within the scope of **SOCIAL COMPETENCE:**	
K01	can apply business and social requirements in a project.	ID1A_K03 ID1A_K04
K02	is aware of the need for continuous modification of the implemented project in both substantive and social aspects.	ID1A_K04

4.4. **Methods of assessment of the intended learning outcomes**

Teaching outcomes *(code)*	**Method of assessment (+/-)**																					
	Exam oral/written*			**Test***			**Project***			**Effort in class***			**Self-study***			**Group work***			**Others* e.g. standardized test used in e-learning**		
	Form of classes			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***		
	L	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*	*L*	*C*	*...*
W01		+								+	+										
W02		+								+	+										
U01									+					+			+				
U02									+					+			+				
U03									+					+			+				
U04									+					+			+				

K01		+																	
K02		+																	

**delete as appropriate*

4.5. **Criteria of assessment of the intended learning outcomes**		
Form of classes	**Grade**	**Criterion of assessment**
lecture (L) (including e-learning)	**3**	achievement of 50–60% of assessment requirements
	3,5	achievement of 61–70% of assessment requirements
	4	achievement of 71–80% of assessment requirements
	4,5	achievement of 81–90% of assessment requirements
	5	achievement of 91–100% of assessment requirements
classes (C)* (including e-learning)	**3**	achievement of 50–60% of assessment requirements
	3,5	achievement of 61–70% of assessment requirements
	4	achievement of 71–80% of assessment requirements
	4,5	achievement of 81–90% of assessment requirements
	5	achievement of 91–100% of assessment requirements
others (...)* (including e-learning)	**3**	achievement of 50–60% of assessment requirements
	3,5	achievement of 61–70% of assessment requirements
	4	achievement of 71–80% of assessment requirements
	4,5	achievement of 81–90% of assessment requirements
	5	achievement of 91–100% of assessment requirements

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	**Student's workload**	
	Full-time studies	**Extramural studies**
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/	***75***	
*Participation in lectures**	30	
*Participation in classes, seminars, laboratories**	30	
*Preparation in the exam/ final test**	15	
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	***50***	
*Preparation for the classes, seminars, laboratories**	20	
*Preparation for the exam/test**	20	
*Gathering materials for the project/Internet query**	10	
TOTAL NUMBER OF HOURS	**75**	
ECTS credits for the course of study	**125**	

**delete as appropriate*

Accepted for execution *(date and legible signatures of the teachers running the course in the given academic year)*

.....