#### card of course

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| Subject name | Relational database systems |

1. The placement of the subject in the study system

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| 1.1. Field of study | Computer science |
| 1.2. Form and path of study | Full-time/Part-time |
| 1.3. Level of education | First-cycle studies |
| 1.4. Study profile | Practical |

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| 1. 5. Specialty | Databases |
| 1.6. Subject Coordinator | Dr Barbara Gocłowska |

2. General characteristics of the subject

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| 2.1. Belonging to a subject group | Optional/practical |
| 2.2. Number of ECTS | 4 |
| 2.3. Language of lectures | English |
| 2.4. Semesters in which the subject is taught | III |
| 2.5.Criteria for selecting course participants | For specialization: Databases |

1. Learning outcomes and course delivery
	1. Subject Objectives

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| No. | Subject Objectives |
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| C1 | Acquiring competencies enabling transactional data processing (OLTP) in SQL and PL/SQL. |
| C2 | Acquiring competencies enabling transactional data processing (OLTP) in T/SQL. |
| C3 | Acquiring knowledge and competencies enabling the creation and management of data structures in a relational database. |
| C4 | Gaining knowledge of database design and SQL statements. |

* 1. Subject-specific learning outcomes, divided into knowledge , skills and competences , with reference to the directional learning outcomes

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| --- | --- | --- | --- |
| No. | Description of subject learning outcomes | Reference to directional effectslearning (symbols) | Method of implementation (mark "X") |
| ST | NST |
| Classes at the University | Activities on the platform | Classes at the University | Activities on the platform |
| After passing the course, the student knows and understands **the knowledge** |
| W1 | The student knows SQL statements and programming constructs of the T/SQL languageused for transactional data processing | INF\_W03INF\_W04 | X |  |  | X |
| W2 | The student knows SQL statements and their syntax, which enable the creation of data structures. | X |  |  | X |
| W3 | The student knows SQL statements that allow managing data structures | X |  |  | X |
| After passing the course, the student is **able** to: |
| U1 | The student is able to explore a transactional database and modify its contents using SQL. | INF\_U14 INF\_U27 | X |  | X |  |
| U2 | The student is able to process transaction data using the psql language | X |  | X |  |
| U3 | The student is able to create data structures that enable data storage and optimal exploration. | X |  | X |  |
| After completing the course, the student is ready to take part in **social competences.** |
| K1 | The student is able to think creatively while creating data structures and their transactional processing using SQL and psql. | INF\_K01INF\_K03 | X |  | X |  |
| K2 | The student understands the need for continuous training in the development of data collection techniques and data mining languages | X |  | X |  |

3.3. Forms of teaching and their number of hours - Full-time studies (ST), Part-time studies (NST)

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Path | Lecture | Exercises | Design | Workshop | Laboratory | Seminar | Lecturer | Classes conducted using distance learning methods and techniques in the form of a lecture | Other | **ECTS points** |
| **ST** | 20 |  |  |  | 30 |  |  |  |  | 4 |
| **NST** |  |  |  |  | 15 |  |  | 10 |  | 4 |

3.4. Content of education (separately for each form of classes: (W, ĆW, PROJ, WAR, LAB, LEK, OTHER). It should be marked (X) how the given content will be implemented (classes at the university or classes on the e-learning platform conducted using distance learning methods and techniques)

TYPE OF CLASS: LECTURE

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| No. | Content of the course | Reference to subject-specific learning outcomes | Method of implementation (mark "X") |
| ST | NST |
| **Classes at the University** | **Activities on the platform** | **Classes at the University** | **Activities on the platform** |
| 1. | Classification of database objects, their purpose and mutual dependencies. Rules for naming database objects. Scalar and object data types. General characteristics of the SQL language and its areas of use. | W3 | X |  |  | X |
| 2. | Eliminating duplicate values in the query result set. Sorting displayed data - criteria and sort order. Conditional data selection. Types of operators in conditional expressions. | W1 | X |  |  | X |
| 3. | Selecting data from multiple sets. Types of set joins. Set-theoretic set operations in SQL. | W1 | X |  |  | X |
| 4. | Analytical operations on data. Grouping data. Grouping criteria. Defining conditions for selecting analytical data. | W1 | X |  |  | X |
| 5. | Inserting single records and sets of records into a table. Modifying data in a table. Limiting the scope of modified data. Deleting data. Limiting the scope of deleted data. Managing transactions in SQL. | W3 | X |  |  | X |
| 6. | Methods for defining the structure of tables. Defining data validity rules by creating and naming column and table integrity constraints. Determining the activity of integrity constraints. Modifying the structure of tables by adding/removing columns and changing the data type and size. Adding and removing integrity constraints for existing tables. Techniques for activating and deactivating integrity constraints. | W2 | X |  |  | X |
| 7. | Classification of data types in psql, their purpose and mutual dependencies. Rules for naming lexical units. Declarations of constants and scalar and complex variables. User types. | W2 | X |  |  | X |
| 8. | Conditional statements IF...THEN...ELSE, CASE. | W1 | X |  |  | X |
| 9. | Cursors as a technique for processing multi-row data sets. Classification of cursors. Modification of data in tables using cursors. Cursor variables in efficient data processing. | W1 | X |  |  | X |
| 10. | Psql procedures and functions - declaring, calling | W1 | X |  |  | X |
| 11. | Summary of classes and discussion of grades. |  | X |  |  | X |

TYPE OF CLASS: LABORATORY

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| --- | --- | --- | --- |
| No. | Content of the course | Reference to subject-specific learning outcomes | Method of implementation (mark "X") |
| ST | NST |
| **Classes at the University** | **Activities on the platform** | **Classes at the University** | **Activities on the platform** |
| 1. | Selecting data from a table (SELECT statement). Sorting data (ORDER BY clause) and eliminating duplicate values (DISTINCT clause). Defining simple and complex record selection conditions – WHERE clause. IN, LIKE, BETWEEN, IS NULL operators. | U1, K1, K2 | X |  | X |  |
| 2. | Combining multiple tables. Using different types of joins – INNER, LEFT, RIGHT, CROSS JOIN. Combining multiple sets – UNION, UNION ALL, INTERSECT, MINUS operators. | U1, K1, K2 | X |  | X |  |
| 3. | Grouping data by single and multiple criteria – GROUP BY clause. Selecting groups by given criteria – HAVING clause. Analytical functions: COUNT, MIN, MAX, SUM, AVG. | U2, K1, K2 | X |  | X |  |
| 4. | Modifying the contents of tables (INSERT, UPDATE, DELETE statements). SELECT statement in DML operations. | U1, K1, K2 | X |  | X |  |
| 5. | Creating and modifying table structures (CREATE TABLE, ALTER TABLE statements). Deleting tables (DROP TABLE statement). Defining data integrity conditions (PRIMARY KEY, FOREIGN KEY, NOT NULL, UNIQUE, CHECK). Activating and deactivating integrity constraints. | U3, K1, K2 | X |  | X |  |
| 6. | Defining T/SQL blocks of a data processing program using declarations of constants, variables, and control statements in structured programming notation | U3, K1, K2 | X |  | X |  |
| 7. | Creating explicit cursors and using them to process data retrieved from the database. Using cursor variables in dynamic query definition and processing their results. | U3, K1, K2 | X |  | X |  |
| 8. | Defining and invoking T/SQL functions and procedures to manipulate data in the database. Using packages built into PL/SQL routines | U1, U2, K1, K2 | X |  | X |  |
| 9. | Summary of classes and discussion of grades. |  | X |  | X |  |

3.5. Methods of verifying learning outcomes (indication and description of methods of conducting classes and verification of achievement of learning outcomes and method of documentation)

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| --- | --- | --- | --- |
| Subject Effects | Teaching methods | Methods of verifying learning outcomes | Documentation methods |
| KNOWLEDGE |
| W1-W3 | Lecture with multimedia presentation | Lecture credit assignment: table design implementing the issues learned during the lecture. Applying indexes, analyzing results - concerns the table designed by students. | Graded final assignment |
| SKILLS |
| U1-U3 | Realization of laboratory tasks, discussions | Laboratory: practical tasks solved during classes. The final grade is the arithmetic mean of the grades obtained. | Archived tasks |
| SOCIAL COMPETENCES |
| K1-K2 | Realization of laboratory tasks, discussions | Laboratory: practical tasks solved during classes. The final grade is the arithmetic mean of the grades obtained. | Archived tasks |

3.6. Assessment criteria for the achieved learning outcomes

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| Learning effect | For a grade of 3 or "pass."the student knows and understands/is able to/is ready to | For a grade of 3.5, the student knows and understands/is able to/is ready to | For a grade of 4, the student knows and understands/is able to/is ready to | For a grade of 4.5, the student knows and understands/is able to/is ready to | For a grade of 5, the student knows and understands/is able to/is ready to |
| W | 51-60% of knowledge indicated in learning outcomes | 61-70% of knowledge indicated in learning outcomes | 71-80% of knowledge indicated in learning outcomes | 81-90% of knowledge indicated in learning outcomes | 91-100% of knowledge indicated in learning outcomes |
| U | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |
| K | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |

3.7. Literature

**Basic**

* Piotr Muryjas, Maria Skublewska-Paszkowska, Dariusz Gutek: Współczesne technologie informatyczne. Eksploatacja baz danych. Politechnika Lubelska, 2011
* http://www.techonthenet.com/sql/index.php (SQL course in English)

**Supplementary**

* <https://www.w3schools.com/sql/>
* <https://neon.tech/postgresql/tutorial>

4. Student workload - ECTS points balance

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| --- | --- |
| **Types of student activity** | **Student Load** |
| **ST** | **NST** |
| **Classes requiring direct contact between the student and the academic teacher at the university premises** | **50** | **25** |
| Classes included in the study plan | 50 | 25 |
| **Student's own work** | **50** | **75** |
| Ongoing preparation for classes, preparation of project work/presentations/etc. | 25 | 35 |
| Preparation for passing classes | 25 | 40 |
| **TOTAL STUDENT HOURLY LOAD** | **100** | **100** |
| **Number of ECTS points** | **4** | **4** |

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| Last change date | 30/09/2024 |
| The changes were introduced | INF Education Quality Team |
| The changes were approved | Arkadiusz Gwarda, M.A. |