

SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026 TO 2029

ACADEMIC YEAR 2027/2028

1. BASIC COURSE/MODULE INFORMATION

Course/Module title	Database Systems
Course/Module code *	
Faculty (name of the unit offering the field of study)	Faculty of Exact and Technical Sciences
Name of the unit running the course	Institute of Mathematics
Field of study	Mathematics
Qualification level	First-cycle studies (Bachelor's)
Profile	General academic
Study mode	Full-time
Year and semester of studies	Year 2, Semester 4
Course type	Specialisation course
Language of instruction	English
Coordinator	Paweł Pasteczka, PhD
Course instructor	Paweł Pasteczka, PhD

* - as agreed at the faculty

1.1. Learning format – number of hours and ECTS credits

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	ECTS credits
5	30		30					6

1.2. Course delivery methods

traditional classroom-based instruction

no distance learning / or optional use of distance learning methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

Lecture – exam

Laboratory – pass with a grade

2. PREREQUISITES

Understanding of data processing rules for basic and complex data types in any procedural programming language. Basic programming knowledge. Object-oriented programming.

3. OBJECTIVES, LEARNING OUTCOMES, COURSE CONTENT, AND INSTRUCTIONAL METHODS

3.1. Course/Module objectives

O1	Providing knowledge and developing skills in designing and operating database systems.
O2	Developing skills in data processing in relational databases using a procedural language.
O3	Developing skills necessary to build an information system based on a relational database.

3.2. COURSE/MODULE LEARNING OUTCOMES (TO BE COMPLETED BY THE COORDINATOR)

Learning Outcome	The description of the learning outcome defined for the course/module	Relation to the degree programme outcomes
LO_01	The student knows and understands basic methods of designing relational databases.	K_Wo6
LO_02	The student knows and understands SQL and at least one technology for accessing relational databases from a web application.	K_Wo6
LO_03	The student is able to design relational databases, program in SQL, and create applications in a selected programming language that access relational databases.	K_U15
LO_04		K_Ko2

	The student is ready to present a critical attitude towards received content and is aware of possible errors in database design.	
LO_05	The student is ready to recognize the importance of database design knowledge in solving practical problems.	K_K03

3.3. Course content (to be completed by the coordinator)

A. Lectures

Content outline
Introduction to database systems. Relational data model: data structures, integrity constraints, operations.
Conceptual modelling: entity–relationship model. Transformation from conceptual to relational model. Normalisation and denormalisation of relational database schemas.
Data Definition Language (DDL): syntax overview. Creation, modification, and deletion of database objects. Data dictionary.
Data Manipulation Language (DML): commands and syntax. Transaction concept and management. Data integrity and constraint handling. Indexes and database optimisation.
SQL language: projection, selection, grouping, sorting, joins, union, intersection, difference, subqueries, correlated queries.
Selected SQL functions: numeric, string, date, conversion, conditional functions.
Information security in database systems. Access rights management and privilege levels.
Procedural database language PL/SQL: data definition, control structures, cursor handling, exception handling.
Stored functions and procedures. Sequences.
Active databases: triggers.
Theoretical foundations of user interface design. User interface architecture.
Mapping data structures into graphical user interfaces. Types of UI components.
Properties of graphical elements and their specification. Application functionality overview.
Two-tier and three-tier application architecture with implementation examples using modern programming languages (e.g., C#, Java, PHP).
Data exploration from relational databases using selected office applications.

B. Classes, laboratories, seminars, practical classes

Content outline
Conceptual modelling: entity–relationship model. Transformation from conceptual to relational model. Normalisation and denormalisation of relational database schemas.
DDL syntax and database object management. DML commands and transaction handling. Data integrity and constraints. Indexing and optimisation.
SQL: projection, selection, grouping, sorting, joins, set operations, subqueries, correlated queries.
SQL functions: numeric, string, date, conversion, conditional.
Database security: access rights and privilege levels.
PL/SQL: data definition, control structures, cursors, exception handling.
Stored procedures, functions, and sequences.
Triggers in active databases.
DML and transaction management (repeated emphasis in practice).

3.4. Methods of Instruction

Laboratory classes: problem solving, discussion, group work.

Lectures: problem-based lecture / multimedia presentation.

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

Learning outcome	Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes)	Learning format (lectures, classes,...)
LO-01	exam, test	lectures, lab
LO-02	exam, test	lectures, lab
LO-03	exam, test	lectures, lab
LO-04	observation during classes	lectures, lab
LO-05	observation during classes	lectures, lab

4.2 Course assessment criteria

Laboratory classes are assessed based on two tests (or one resit test if necessary).

The course is passed based on the exam result.

A student receives a failing grade if they do not pass the laboratory classes or if the exam shows that at least one of LO_1–LO_3 has not been achieved.

Grading scale:

50–59% – satisfactory (3.0)

60–69% – satisfactory plus (3.5)

70–79% – good (4.0)

80–89% – good plus (4.5)

90–100% – very good (5.0)

5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	60
Other contact hours involving the teacher (consultation hours, examinations)	5
Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	85
Total number of hours	150
Total number of ECTS credits	6

* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

Number of hours	<i>Not applicable</i>
Internship regulations and procedures	<i>Not applicable</i>

7. Instructional materials

Compulsory literature: <ol style="list-style-type: none">1. Silberschatz, Abraham; Korth, Henry F.; Sudarshan, S. 2019. Database System Concepts. 7th ed. New York, NY: McGraw-Hill Education.2. Hoffer, Jeffrey A.; Topi, Heikki; Venkataraman, Ramesh. 2023. Modern Database Management. 14th ed. Hoboken, NJ: Pearson.3. Coronel, Carlos; Morris, Steven. 2023. Database Systems: Design, Implementation, & Management. 15th ed. Boston, MA: Cengage Learning.4. Elmasri, Ramez; Navathe, Shamkant B. 2016. Fundamentals of Database Systems. 7th ed. Boston, MA: Pearson.
Complementary literature: <ol style="list-style-type: none">1. Beaulieu, Alan. 2020. Learning SQL: Generate, Manipulate, and Retrieve Data. 3rd ed. Sebastopol, CA: O'Reilly Media.

2. Karwin, Bill. 2020. SQL Antipatterns, Volume 1: Avoiding the Pitfalls of Database Programming. 2nd ed. Raleigh, NC: Pragmatic Bookshelf.
3. Winand, Markus. 2022. SQL Performance Explained. 3rd ed. Self-published (Markus Winand), Vienna.
4. Tidwell, Jenifer; Brewer, Charles; Valencia, Aynne. 2020. Designing Interfaces: Patterns for Effective Interaction Design. 3rd ed. Sebastopol, CA: O'Reilly Media.

Approved by the Head of the Department or an authorised person
Wydanie : 15th ed.