KHMELNYTSKYI NATIONAL UNIVERSITY

APPROVED
Dean of IT Faculty
_____ HOVORUSHCHENKO T.
"___" _____ 2025.

WORKING PROGRAMME OF THE EDUCATIONAL COMPONENT
Databases

Field of Study:	F Informational technology
Specialty:	F2 « Software Engineering»
Level of Higher Education:	First (Bachelor's) Level
Educational and Professional Programme:	Software Engineering
Course Load:	5 ECTS credits
Course Code:	CPT.06
Language of Instruction:	Ukrainian
Status of the Educational Component:	Compulsory (Professional Training)
Faculty:	Faculty of Information Technology
Department:	Department of Software Engineering

Form of Study	Year	Semester	Total Credits		Number of hours						Course project	Coursework	Semester control form	
					Contact Hours					Independent Work (incl. Individual Tasks)				
			ECTS credits	hours	Total	Lectures	Laboratory works	Practical classes	Seminar classes				pass/ fail test	Exam
D	1	2	5	150	82	16	34			100	+			+

The working programme is based on the Educational and Professional Programme "Software Engineering" within the specialty F2 "Software Engineering".

Program's author _____ Natalia PRAVORSKA

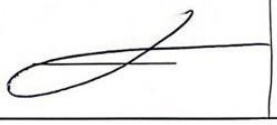
Approved at the meeting of the Department of Software Engineering
Minutes No. 1 dated August 28, 2025
Head of the Department _____ L.P. Bedratyuk

The working programme was reviewed and approved by the Academic Council of the Faculty of Information Technology

Chair of the Academic Council _____ Tetiana HOVORUSHCHENKO

Khmelnytskyi 2025

LETTER OF APPROVAL

Position	Department Name	Signature	First Name, LAST NAME
Head of *D*epartment DSc, Prof.	Software Engineering		Leonid BEDRATIUK
Programme Guarantor DSc, Prof.	Software Engineering		Leonid BEDRATIUK

DATADASES

Type of Educational Component	Compulsory
Level of Higher Education	First (Bachelor's) Level
Language of Instruction	English
Semester	Second
Number of ECTS Credits Assigned	5
Forms of Study the Course is Designed For	Full-time

Learning Outcomes. Upon successful completion of the course, the student should be able to: *apply* modern information technologies and have the skills to develop and create databases, *use* Internet resources; *analyze* the subject area defined by the framework of a specific project; *build* a conceptual data model based on the results of the analysis of the subject area; *transform* the conceptual data model into a data-logical model of the physical structure of the database; *master* the SQL language in its DDL (Data Definition Language) sections and single-table SELECT queries; *administer* relational SQL database management systems based on MySQL at the user level.

Course Content. Structured Query Language (SQL). Queries when working with databases. Basic operations on relations. Representations, stored procedures, and functions when working with databases. Cursors. Triggers and Transactions. Data protection in databases. Normalization. Entity-Relationship Model (ER-DIAGRAMS

Planned Learning Activities. The minimum amount of classroom-based learning activities in one ECTS credit for a course at the first (Bachelor's) level of higher education in full-time study mode is 10 hours per 1 ECTS credit.

Forms (Methods) of Instruction: Lectures (using problem-based learning and visualisation methods), Laboratory works, Independent work

Assessment Methods: Laboratory work defence, Testing

Form of Final Assessment: Exam

Learning Resources:

1. DataBase : methodological recommendations for laboratory work for applicants of the first (bachelor) level of higher education , specialty F2 " Software engineering " = Databases: methodological recommendations for laboratory work for applicants of the first (bachelor's) level of higher education in the specialty F2 "Software Engineering" / N.I. Pravorska , Y.V. Forkun , V. O. Boyko. Khmelnytskyi: KhNU, 2025. 120 p. (English, Ukrainian).
2. Alan Beaulieu Learning SQL: Generate , Manipulate , and Retrieve Data / Beaulieu Alan - O'Reilly Media 2020. - 377 pages .
3. Carlos Coronel. Database Systems : Design , Implementation , & Management (MindTap Course Letter) / Coronel Carlos , Morris Steven - Boston , Massachusetts : Cengage Learning - 14th edition , 2022 - 816 p .
4. Josephine Bush. Learn SQL Database Programming : Query and Manipulate Databases from Popular Relational Database Servers Using SQL. Packt Publishing. -2020 – pp..564
5. Ying Bai . SQL Server Database Programming with Visual Basic.NET /Ying Bai - Wiley, 2020 - 688p .

Lecturer: Candidate of Sciences, Associate Professor Pravorstka N.I., assistant Boyko V. O.

3. EXPLANATORY NOTE

The discipline "Databases" is a compulsory discipline of professional training and occupies a leading place in the preparation of applicants for the first (bachelor's) level of higher education in the educational and professional program "Software Engineering" within the scope of the specialty F2 "Software Engineering". This discipline is also an applied direction, which is designed to consolidate and develop in bachelor's degree applicants the skills of using modern methods of database design and development

Prerequisites – CPT.03 Programming, CGT.03 Discrete Mathematics.

Corequisites – CPT.11 Web Technologies, OFP.12 Web Technologies (Course Project)

In accordance with the educational programme, the course contributes to the development of:

- ***competences***: (IC) Ability to solve complex, specialised tasks or practical problems in software engineering, characterised by complexity and uncertainty of conditions, using information technology theories and methods.; (PC07) Proficiency in knowledge about information data models; ability to create software for data storage, retrieval, and processing.; (PC13) Ability to reasonably choose and master the toolkit for software development and maintenance.
- ***software results training*** : (PLO01) To analyse, purposefully search for, and select the necessary information, reference resources, and knowledge for solving professional tasks, considering modern scientific and technical achievements; (PLO07) To understand and apply in practice the fundamental concepts, paradigms, and basic principles of functioning linguistic, instrumental, and computational tools of software engineering; (PLO13) To know and apply methods for algorithm development, software design, and data and knowledge structures; (PLO15) To make informed decisions when choosing programming languages and development technologies to address the tasks of creating and maintaining software; (PLO18) To know and be able to apply information technologies for data processing, storage, and transmission; (PLO21) To understand, analyse, select, and competently use tools to ensure information security (including cybersecurity) and data integrity relative to applied tasks and created software systems.

The purpose of the course: to form in students a system of knowledge, skills and abilities in the application of database design and development methods necessary for professional activity in the field of software engineering.

Subject of the course*:* Study of theoretical foundations and practical skills of working with databases, including data models, database management systems (DBMS), design, implementation and maintenance of databases, relational database management systems SQL based on MySQL .

Course objectives: to provide in students a system of knowledge and practical skills in the field of using methods and tools for designing and developing databases; to develop professional skills in the field of data engineering and knowledge of developing and designing applications, to form skills in designing and presenting the results of research.

Learning outcomes: *be able to apply* modern information technologies and have the skills to develop and create databases, use Internet resources; *analyze* the subject area defined by the framework of a particular project; *build* conceptual data model based on the analysis results subject regions; *convert* conceptual data model into a data logical model of the physical structures bases data; *have* SQL language in its DDL (Data Definition Language) and single-table requests SELECT constructs; *to administer* at the level user relational database management systems SQL based on MySQL .

4. Structure of credits of the discipline
“ Databases ”

Topics	Lectures	Lab . work	Independent work of students
Topic 1. Introduction to Databases. Introduction to the Structured Query Language SQL.	2	4	14
Topic 2. Getting Started with Designing and Creating Databases and Tables	2	4	14
Topic 3. Queries when working with databases. Basic operations on relations	4	4 4	16
Topic 4. Representations, stored procedures, and functions when working with databases	2	4	14
Topic 5. Cursors. Triggers and Transactions	2	4	14
Topic 6. Data protection in databases. Normalization	2	4	14
Topic 7. Normalization continued. Entity-Relationship Model (ER-DIAGRAMS)	2	6	14
Total for the 2nd semester	**16**	**34**	**100**

5. COURSE PROGRAM
“ Databases”

5.1. Lecture course content *

Lecture No.	List of lecture topics, their abstract	Number of hours
Topic 1. Introduction to Databases. Introduction to the Structured Query Language SQL.		
1	**Lecture 1.** New concepts of database. Relational databases. Relational relationships between database tables. Standard and implementation of the SQL language. Introduction to client-server technology. Types of SQL commands. Advantages of the SQL language. Writing SQL statements. Literature: [2] pp.20-50 [3] pp.20-78	2
Topic 2. Getting Started with Designing and Creating Databases and Tables		
2	**Lecture 2.** Defining data structures. SQL language data types defined by the standard. Data types used in SQL server. Basic concepts of MS SQL Server. SQL control constructs. Basic objects of the SQL server database structure. Stages of database design methodology. Conceptual database design methodology (5 main stages). Schematic representation. Beginning database design. Database creation and table design. Literature: [4] pp.18-44 [6] pp.35-59	2
Topic 3. Queries when working with databases. Basic operations on relations		
3	**Lecture 3.** Efficient execution of queries for data selection. SELECT component. FROM component. WHERE component. Relational operator groups. Cartesian product. Selection operation. Projection operation. Join operation on two relations (tables). Union operation. Intersection operation. Difference operation. Division operation of relations. Literature: [3] pp.120-148, [10]	2
4	**Lecture 4.** Calculating and summing in queries. Building calculated fields. Using summary functions. GROUP operator. HAVING operator. The concept of a subquery. Using subqueries that return multiple values. Using IN and NOT IN operations. Using the ANY and ALL keywords. Add query. Delete query .	2

	Update query. Introduction to the concept of "data integrity". References: [3] pp.450-480, [7] pp.95-105 [10]	
Topic 4. Representations, stored procedures, and functions when working with databases		
5	**Lecture 5.** Views. Definition of a view. Updating data in views. Advantages of using views. Disadvantages of using views. The concept of a stored procedure. Types of stored procedures. Creating, modifying and deleting stored procedures. Executing a stored procedure. The concept of a user function. Scalar functions . Inline functions . Multi- statement functions . Built-in functions. Literature: [3] pp.401-412, [6] pp.26-117. [10]	2
Topic 5. Cursors. Triggers and Transactions		
6	**Lecture 6.** The concept of a cursor. Implementing cursors in the MS SQL Server environment. Managing a cursor in the MS SQL Server environment. Defining a trigger in the SQL language standard. Implementing triggers in the MS SQL Server environment. Trigger types. Trigger programming. Introduction to transactions. ACID properties of transactions. Locking. Transaction management. Managing transactions in the MS SQL Server environment. Literature: [3] pp.595-602, [9] pp.200-248 [1] pp.618-648, [10]	2
Topic 6. Data protection in databases. Normalization		
7	**Lecture 7.** Basic data protection methods. User management in MS SQL Server. Security system administration. Roles. Data access management. Defining privileges in the language standard. Granting privileges to users. Revoking privileges granted to users. Implementing rights to access database objects in MS SQL Server. Categories of rights in MS SQL Server. Granting rights. Rights to execute SQL commands. Implicit rights. Access denial. Implicit access denial. Access conflicts. Normalization. Data redundancy and update anomalies (UPDATE). Insertion anomalies (INSERT). Removal anomalies (DELETE). Modification anomalies. Functional dependency. Normalization process. Literature: [6] pp.31-34, [10] [7] pp.52-58, [9]	2
Topic 7. Normalization continued. Entity-Relationship Model (ER-DIAGRAMS)		
8	**Lecture 8.** First normal form (1NF). Second normal form (2NF). Complete functional dependency. Third normal form (3FN). Transitive dependency. Definition of third normal form. Repetition of previous material. Transitive dependency . Correctness of normalization procedure. Hess theorem. Higher-order normal forms. Boyce-Codd normal form (BCNF). Entity-relationship model (ER-DIAGRAMS). Literature: [6] pp.31-34, [10], [7] pp.52-58, [9], [5] pp.480-506	2
Total for the 4th semester		**16**

5.2 Laboratory content

No. of the company	Laboratory topics	Hours
1	Database design and modeling	4
2	Database design and creation	4
3	Requests	4
4	Virtual tables. Stored procedures and functions	4
5	Triggers. Transactions	4
6	Rights and privileges	4
7	Database access technologies. Server and client utilities.	4
8	Database reengineering and optimization	6
Total for the 4th semester		**34**

5.3 Content of independent work

The volume of independent work in the discipline "Databases" is 100 hours. They include the study of lecture material, theoretical and laboratory tasks, preparation for laboratory work, their defense, and current testing.

Independent work of higher education applicants consists of systematic study of program material from relevant sources of information, preparation for laboratory classes, completion of individual tasks, testing of theoretical material, etc. In addition, students have access to the discipline page in the Modular Learning Environment, where the Discipline Work Program and necessary documents for its educational and methodological support are posted.

Week number	Topic name	Hours
1	**Topic 1. Introduction to Databases. Introduction to the SQL structured query language.** Study of lecture material, performance of laboratory work No. 1. Literature: [2] pp.20-50 [3] pp.20-78	6
2	**Topic 1. Introduction to Databases. Introduction to the SQL structured query language.** Study of lecture material. Defense of laboratory work No. 1. Literature: [2] pp.20-50 [3] pp.20-78	8
3	**Topic 2. Beginning of designing and creating databases and tables** Study of lecture material, performance of laboratory work No. 2. Literature : Literature : [4] pp.18-44 [6] pp.35-59	6
4	**Topic 2. Beginning of designing and creating databases and tables** . Study of lecture material. Defense of laboratory work No. 2. Literature: [4] pp.18-44 [6] pp.35-59	8
5	**Topic 3. Queries when working with databases. Basic operations on relations** . Study of lecture material. Performing laboratory work No. 3. Preparing for the test. Literature: [3] pp.450-480, [7] pp.95-105, [10]	4
6	**Topic 3. Queries when working with databases. Basic operations on relations** . Study of lecture material. Defense of laboratory work No. 3. Literature: [7] pp.95-105, [10]. Testing	6
7	**Topic 3. Queries when working with databases. Basic operations on relations** . Study of lecture material. Performance of laboratory work No. 4. Literature: [7] pp. 95-105, [10].	6
8	**Topic 4. Representations, stored procedures and functions when working with databases** . Study of lecture material. Defense of laboratory work No. 4. Literature: [3] pp.401-412, [6] pp.26-117. [10]	6
9	**Topic 4. Representations, stored procedures and functions when working with databases** . Study of lecture material. Performance of laboratory work No. 5. Literature: [3] pp.401-412, [6] pp.26-117. [10]	8
10	**Topic 5. Cursors. Triggers and transactions.** Study of lecture material. Defense of laboratory work No. 5. Literature: [3] pp.595-602, [9] pp.200-248 [1], pp.618-648, [10]	6
11	**Topic 5. Cursors. Triggers and transactions.** Study of lecture material. Performance of laboratory work No. 6. Literature: [3] pp.595-602, [9] pp.200-248 [1], pp.618-648, [10]	8
12	**Topic 6. Data protection in databases. Normalization.** Study of lecture material, defense of laboratory work No. 6. Literature: [6] pp.31-34, [10] [7] pp.52-58, [9]	4
13	**Topic 6. Data protection in databases. Normalization.** Study of lecture material, performance of laboratory work No. 7. Literature: [6] pp.31-34, [10] [7] pp.52-58, [9]	4
14	**Topic 6. Data protection in databases. Normalization.** Study of lecture material, defense of laboratory work No. 7. Literature: [6] pp.31-34, [10] [7]	6

	pp.52-58, [9]	
15	**Topic 7. Normalization of continuation. Entity-Relationship Model (ER-DIAGRAMS).** Study of lecture material. Performance of laboratory work No. 8. Literature:. Literature: [6] pp.31-34, [10]	6
16	**Topic 7. Normalization continued. Entity-Relationship Model (ER-DIAGRAMS)** Study of lecture material. Defense of laboratory work No. 8. Literature:. Literature: [7] pp.52-58, [9], [5] pp.480-506	8
Total for the 4th semester		**100**

Students are given the questions on each topic specified in the methodological recommendations for laboratory classes and independent work for independent study. The teacher supervises independent work and monitors the completion of individual assignments according to the schedule of consultations outside of class hours. Requirements for completing tests (for part-time students) and individual homework (for full-time students) are set out in the Modular Learning Environment on the page of the academic discipline.

6. TECHNOLOGIES AND TEACHING METHODS

6. Technologies and teaching methods

The process of learning in the discipline is based on the use of traditional and modern technologies and teaching methods, in particular: teaching methods by the source of information transmission and perception (verbal (explanation, discussion, consultation), practical (instruction , solving situational problems), visual (demonstration, illustration, observation); by the logic of transmission and perception of educational information; by the level of independence of cognitive activity (problem presentation methods, partly search, research); methods of stimulating and motivating learning, interactive; method of analyzing specific situations (case- study) using visualization technologies, information and communication technologies and distance learning technologies (service for conducting online conferences Zoom , Modular learning environment, etc.).

The learning process in the discipline is based on the use of traditional and modern technologies, in particular:

– lectures (using multimedia presentations, visualization methods, explanations, problem-based and interactive learning, stimulation and motivation methods, **information and communication technologies,** intensification and individualization of learning, etc.);

– laboratory classes (using computer modeling methods, project methods, training exercises, analysis of problem situations, explanation, discussion, conversation, demonstration, observation, using cases, solving problems, presentations);

– independent work (work on mastering theoretical material, completing individual and homework assignments, preparing for current and final tests, etc.).

7. METHODS OF ASSESSMENT

Ongoing assessment is carried out during practical classes, as well as on the days of control activities established by the working programme and the academic schedule.

The following methods of ongoing assessment are used:

– test-based assessment of theoretical material;

– evaluation of the results of laboratory work defence.

When determining the final semester grade, the results of both ongoing assessment and final assessment are taken into account. The final assessment is conducted on all the material of the course according to examination papers prepared in advance and approved at the meeting of the department.

A student who has scored less than 60 percent of the maximum score for any type of academic work is not allowed to undergo the semester assessment until the amount of work stipulated by the Working Programme is completed. A student who has achieved a positive weighted average score (60 percent or more of the maximum score) for all types of ongoing assessment but has failed the examination is considered to have an academic debt.

Elimination of academic debt for the semester assessment is carried out during the examination session or according to the schedule set by the dean's office in accordance with the *Regulation on Control and Assessment of Learning Outcomes of Students at Khmelnytskyi National University*.

8. COURSE POLICY

The policy of the academic course is generally determined by the system of requirements for the student as stipulated by the current University regulations on the organisation and teaching and learning support of the educational process. In particular, this includes completing the safety briefing; attendance at course classes is compulsory. For valid reasons (documentarily confirmed), theoretical training may, with the lecturer's approval, take place online. Successful completion of the course and the formation of professional competences and programme learning outcomes require preparation for each laboratory work (studying the theoretical material for the topic of the work), active participation during the class, thorough preparation of the report, defence of the results, participation in discussions regarding the constructive decisions made during the laboratory works, etc.

Students must meet the established deadlines for completing all types of academic work in accordance with the Working Programme of the course. A missed laboratory class must be completed within the deadline set by the lecturer, but no later than two weeks before the end of the theoretical classes in the semester.

The student's mastery of the theoretical material of the course is assessed through testing.

When performing laboratory work, the student must comply with the policy of academic integrity (cheating, plagiarism — including with the use of mobile devices — is prohibited). If a violation of academic integrity is detected in any type of academic work, the student receives an unsatisfactory grade and must re-do the task on the relevant topic (type of work) as stipulated by the Working Programme. Any form of academic dishonesty is unacceptable.

Within the framework of studying the course, students are provided with recognition and crediting of learning outcomes acquired through non-formal education, available on accessible platforms (https://prometheus.org.ua/, https://www.coursera.org/), which contribute to the formation of competences and the deepening of learning outcomes defined in the Working Programme of the course, or ensure the study of a relevant topic and/or type of work from the course syllabus (for more details, see the *Regulation on the Procedure for Recognition and Crediting of Learning Outcomes of Students at Khmelnytskyi National University*).

9. ASSESSMENT OF STUDENTS' LEARNING OUTCOMES DURING THE SEMESTER

Assessment of a student's academic achievements is carried out in accordance with the *Regulation on the Control and Assessment of Students' Learning Outcomes at Khmelnytskyi National University*. During the ongoing assessment of the work performed by the student for each structural unit and the results obtained, the lecturer awards a certain number of points as set out in the Working Programme for that type of work.

Each structural unit of academic work may be credited only if the student has scored at least 60 percent (the minimum level for a positive grade) of the maximum possible points assigned to that structural unit.

When assessing students' learning outcomes for any type of academic work (structural unit), it is recommended to use the generalised criteria provided below:

Table – Assessment Criteria for Student Learning Outcomes

Grade and Level of Achievement of Intended Learning Outcomes and Competences	General Description of Assessment Criteria
Excellent *(High)*	The student has deeply and fully mastered the course content, confidently navigates it, and skilfully uses the conceptual framework; demonstrates the ability to connect theory with practice, solve practical problems, and clearly express and justify their reasoning. An excellent grade implies a logical presentation of the answer in the language of instruction (oral or written),

Grade and Level of Achievement of Intended Learning Outcomes and Competences	General Description of Assessment Criteria
	high-quality formatting of the work, and proficiency in using specialised tools, instruments, or application software. The student demonstrates confidence when answering reformulated questions, is capable of making detailed and summarised conclusions, and shows practical skills in solving professional tasks. The answer may contain two or three minor inaccuracies.
Good *(Average)*	The student has shown full understanding of the course content, possesses the conceptual framework, and navigates the material well; applies theoretical knowledge consciously to solve practical tasks. The answer is generally well-articulated, although some minor inaccuracies or vague formulations of rules or principles may occur. The student's answer is based on independent thinking. Two or three minor mistakes are acceptable.
Satisfactory *(Sufficient)*	The student demonstrates knowledge of the basic course material sufficient for continued learning and practical activity in the profession; is able to complete the practical tasks foreseen by the programme. The answer is usually based on reproductive thinking. The student has limited knowledge of the structure of the discipline, makes inaccuracies and significant errors in the answer, and hesitates when answering reformulated questions. Nevertheless, they possess basic skills to complete simple practical tasks that meet the minimum assessment criteria and, under the lecturer's guidance, can correct their mistakes.
Unsatisfactory *(Insufficient)*	The student demonstrates fragmented, unstructured knowledge, cannot distinguish between main and secondary ideas, makes conceptual errors, misinterprets definitions, presents material in a chaotic and unconfident manner, and cannot apply knowledge to solve practical problems. An unsatisfactory grade is typically given to a student who is unable to continue learning the subject without additional study.

Structuring of the Course by Types of Academic Work and Assessment of Student Learning Outcomes

Classroom work								**Control measures**	**Semester control**	**Together**
Second semester										
Laboratory work No.:								Test control:	Exam	Total points
1	2	3	4	5	6	7	8	T		
Number of points per type of academic work (minimum-maximum)										
3-5	3-5	3-5	3-5	3-5	3-5	3-5	3-5	3-5		
24-40								**12-20**	**24-40**	**60-100**

Symbols : T – subject topic

Notes: If the number of points earned for any type of academic work in the course is below the established minimum, the student receives a failing grade and must retake the work within the deadline set by the lecturer (or dean). The institutional grade is determined in accordance with the table "**Correspondence between the Institutional Grading Scale and the ECTS Grading Scale**".

Assessment of Laboratory Work Defence Results

A laboratory work completed and formatted in accordance with the requirements established in the Methodological Guidelines is comprehensively assessed by the lecturer during its defence based on the following criteria:

– independence and accuracy of execution;
– completeness of the answer and understanding of the principles of building machine learning models;
– ability to justify the choice of algorithm or method;
– correctness of model implementation in the Python programming environment using appropriate libraries;
– ability to interpret the results of modelling and evaluate their suitability for solving the given task.

When assessing a laboratory session, the lecturer uses the generalised criteria outlined in the table "Assessment Criteria for Student Learning Outcomes" (minimum passing score – 3 points, maximum – 5 points).

If the student demonstrates a knowledge level below 60 percent of the maximum score established in the Working Programme for each structural unit, the laboratory work is not credited. In such a case, the student must study the topic more thoroughly, review the methodology, correct major mistakes, and re-defend the work at the time set by the lecturer.

Assessment of Test-Based Control Results

Each test included in the Working Programme consists of 30 test items, each carrying equal weight. According to the table for structuring types of academic work, the student may receive between 3 and 5 points depending on the number of correct answers.

Distribution of points depending on the number of correct answers to test items: The test duration is 30 minutes. Students complete the test online in the Modular Learning Environment. If a failing grade is received, the test must be retaken before the next scheduled assessment.

Distribution of points depending on correct answers to test questions

Number of Correct Answers	1-17	18-23	24-26	27-30
Percentage of Correct Answers	0-59	60-79	80-89	90-100
Number of Points	-	3	4	5

The test is given 30 minutes. The student takes the test online in the Modular Learning Environment. If the test is negative, the test must be retaken before the next control deadline.

The final semester grade according to the institutional grading scale and the ECTS grading scale is determined automatically after the lecturer enters the assessment results in points for all types of academic work into the electronic gradebook. The correspondence between the institutional grading scale and the ECTS grading scale is provided in the table "Correspondence" below.

Assessment of the Final Semester Control (Exam).

The educational programme provides for a final semester control in the form of an examination, the purpose of which is to systematically and objectively assess both the theoretical and practical preparation of the student in the course. The examination is conducted according to examination papers prepared in advance and approved at the meeting of the department. In accordance with this, the examination paper contains a combination of both theoretical questions (including in test form) and practical tasks.

Table – Assessment of Final Semester Examination Results *for full-time students (40 points allocated for final control)*

Type of Task	**For each individual type of task**		
	Minimum (Satisfactory) Score	***Potential Positive Score (Good)****	**Maximum (Excellent) Score**
Theoretical Question № 1	3	4	5
Theoretical Question № 2	3	4	5
Practical Tasks *(6 tasks worth 3 points each)*	18	24	30

Total:	**24**		**40**

Note. ***A passing score for the exam, different from the minimum (24 points) and the maximum (40 points), falls within the range of 25–39 points and is calculated as the sum of points for all structural elements (tasks) of the exam.***

For each individual type of task in the final semester assessment, the assessment criteria for student learning outcomes provided above (see **Table – Assessment Criteria for Student Learning Outcomes**) are applied.

The final semester grade according to the institutional grading scale and the ECTS grading scale is determined automatically after the lecturer enters the assessment results in points for all types of academic work into the electronic gradebook. The correspondence between the institutional grading scale and the ECTS grading scale is shown below in the **Correspondence Table**.

The final examination grade is recorded if the total number of points accumulated by the student in the course as a result of ongoing assessment falls within the range of 60 to 100 points. In this case, a grade of *Excellent/Good/Satisfactory* is assigned according to the institutional scale, and a letter grade is assigned according to the ECTS scale, corresponding to the total number of points earned by the student as specified in the **Correspondence Table**.

Table – Correspondence between the Institutional Grading Scale and the ECTS Grading Scale

<table>
<tr><th rowspan="2">ECTS Grade</th><th rowspan="2">Rating Scale (Points)</th><th colspan="2">Institutional Grade(Level of Achievement of the Intended Learning Outcomes in the Course)</th></tr>
<tr><th>Pass/Fail</th><th>Exam / Graded Credit</th></tr>
<tr><td>A</td><td>90-100</td><td rowspan="5">Pass</td><td>Excellent – a high level of achievement of the intended learning outcomes in the course, indicating the learner’s full readiness for further study and/or professional activity in the field.</td></tr>
<tr><td>B</td><td>83-89</td><td rowspan="4">Good – an average (maximally sufficient) level of achievement of the intended learning outcomes in the course and readiness for further study and/or professional activity in the field.

Satisfactory – the student has demonstrated a minimally sufficient level of achievement of the learning outcomes required for further study and/or professional activity in the field.</td></tr>
<tr><td>C</td><td>73-82</td></tr>
<tr><td>D</td><td>66-72</td></tr>
<tr><td>E</td><td>60-65</td></tr>
<tr><td>FX</td><td>40-59</td><td rowspan="2">Fail</td><td>Fail – several intended learning outcomes in the course have not been achieved. The level of acquired learning outcomes is insufficient for further study and/or professional activity in the field.</td></tr>
<tr><td>F</td><td>0-39</td><td>Fail – no learning outcomes have been achieved.</td></tr>
</table>

10. Questions for student test control in the discipline "DATABASES"

1. Which characteristics are limitations of file systems compared to databases?
2. Which statements correctly describe a database?
3. What ensures "self-description" of data in a DB and its consequence?
4. What capabilities does a DBMS usually provide?
5. Which components are part of the DBMS environment?
6. Which statements about data description levels are correct?

7. Which models are considered object data models?
8. Which statements about the hierarchical data model are correct?
9. Which referential integrity strategies are applied when keys are modified?
10. Which statements about attributes are correct?
11. What is a relational database (RDB)?
12. What are the basic structural elements of a relational DB table?
13. What does the primary key define in a table?
14. Which statements about one-to-many relationships are correct?
15. Which statements about many-to-many relationships are correct?
16. How is a many-to-many relationship implemented in a relational DB?
17. When was SQL standardized by ANSI and ISO?
18. Which organizations are mentioned as SQL standardizers?
19. Which commands belong to DML (Data Manipulation Language)?
20. Which statements about the nature of SQL are correct?
21. How many scalar data types are defined by the SQL standard?
22. Which characteristics define exact numeric data types in SQL?
23. Which SQL data types are used for date and time?
24. What is a domain in SQL?
25. Which operators can delete a domain in SQL?
26. Which of the following data types are integer types in SQL Server?
27. Which SQL Server data types are intended for storing Unicode characters (but do not support UTF-8)?
28. Which functions are used in SQL Server for data type conversion?
29. Which SQL Server control constructs are used to organize loops?
30. Which objects belong to the main objects of a SQL Server database?
31. What are the main stages of database design methodology?
32. What is the main feature of conceptual database design?
33. What is characteristic of logical database design?
34. Which tasks are solved at the stage of physical database design?
35. Which components are included in the local conceptual data model?
36. Which characteristics are inherent to an entity in the DB model?
37. What is an example of an entity instance?
38. Which characteristics are inherent to entity and relationship attributes?
39. What is an attribute domain?
40. Which stages are included in conceptual database design?
41. What does logical database design describe?
42. Which elements are included in the local conceptual model?
43. Which characteristics are inherent to an entity in the DB model?
44. What is an example of an entity instance?
45. Which characteristics are inherent to entity and relationship attributes?
46. What is an attribute domain?
47. Which statements about keys in the data model are correct?
48. What ensures referential integrity between tables?
49. How is a one-to-many relationship implemented in a relational DB?
50. Which statements are correct regarding keys in a data model?
51. What are the key features of the JOIN operator in SQL?
52. Which of the following are OUTER joins in SQL?
53. What are the advantages of using views (VIEW)?
54. Which functions are considered aggregate in SQL?
55. Which statements about the primary key are correct?
56. What are the features of a FOREIGN KEY?
57. Which statements about database normalization are correct?
58. Which constraints can be applied to attributes in SQL?
59. Which operations belong to DML (Data Manipulation Language)?
60. What are the advantages of using indexes in tables?
61. What are the main data types supported by SQL?
62. Which statements about NULL in SQL are correct?
63. Which constraints can be applied to table attributes?

64. Which statements about the SELECT operator are correct?
65. What are the capabilities of the ORDER BY operator?
66. Which of the following functions are string functions in SQL?
67. Which statements about the WHERE operator are correct?
68. Which types of comparisons are supported in WHERE?
69. Which statements about aggregate functions are correct?
70. Which statements about GROUP BY are correct?
71. Which types of JOIN does SQL support?
72. Which statements about INNER JOIN are correct?
73. Which statements about LEFT JOIN are correct?
74. Which statements about RIGHT JOIN are correct?
75. Which statements about FULL OUTER JOIN are correct?
76. Which statements about the UNION operator are correct?
77. Which operators are used for string comparison in SQL?
78. Which statements about the EXISTS operator are correct?
79. Which statements about subqueries are correct?
80. Which statements about indexes are correct?
81. Which types of transactions are supported by SQL?
82. Which statements about COMMIT are correct?
83. Which statements about ROLLBACK are correct?
84. Which statements about SAVEPOINT are correct?
85. Which statements about transaction isolation are correct?
86. Which transaction isolation levels are supported in SQL?
87. Which statements about locking are correct?
88. Which statements about transaction errors are correct?
89. Which statements about transaction atomicity are correct?
90. Which statements about transaction logging are correct?
91. Which statements about basic DDL operations (Data Definition Language) are correct?
92. Which statements about ALTER TABLE are correct?
93. Which statements about UNIQUE constraints are correct?
94. Which statements about PRIMARY KEY are correct?
95. Which statements about FOREIGN KEY are correct?
96. Which statements about CHECK constraints are correct?
97. Which statements about DEFAULT constraints are correct?
98. Which statements about table UNION are correct?
99. Which statements about indexes are correct?
100. Which statements about JOIN and WHERE are correct?

11. QUESTIONS FOR THE FINAL TEST OF STUDENTS IN THE DISCIPLINE "DATABASES"

1. Define a relational database, its functions, and main characteristics.
2. List the components included in the structure of a database.
3. Describe the main stages of the development of database management systems (DBMS).
4. Explain the difference between a file system and a database.
5. Characterize the main types of data models.
6. Define conceptual database design.
7. Explain the purpose of the ANSI/SPARC three-level architecture.
8. State the main responsibilities of a database administrator.
9. Describe the process of designing an information system based on a database.
10. Identify the main requirements for data models.
11. Define an entity and an attribute in the context of databases.
12. Explain the difference between a domain and an attribute. Provide examples.
13. Define a primary key and alternative keys. Provide examples.
14. Explain the difference between a simple and a composite key. Provide examples.
15. Define a foreign key. Provide examples.

16. Characterize the concept of a "tuple" in the relational model.
17. Give an example of a relational relation and its properties.
18. Explain the difference between conceptual, logical, and physical data models.
19. List the main integrity constraints of the relational model.
20. Describe examples of anomalies that occur in non-normalized tables.
21. Define SQL and its main sublanguages.
22. Explain the purpose of the DDL sublanguage and name its main functions.
23. Explain the purpose of the DML sublanguage and name its main functions.
24. Characterize the DCL sublanguage and its capabilities.
25. Provide examples of SQL commands for creating tables.
26. Define the SELECT operator and its main constructs.
27. Explain the purpose of the WHERE clause.
28. Provide examples of SQL aggregate functions.
29. Explain the difference between INNER JOIN, LEFT JOIN, and RIGHT JOIN. Provide examples.
30. Describe the concept of nested subqueries in SQL. Provide examples.
31. Explain the concept of a view (VIEW) in SQL. Provide examples.
32. Explain what a view is. Provide examples of creating and using views.
33. Explain the difference between base tables and derived tables. Provide examples.
34. Define an index in SQL and explain its purpose. Provide examples.
35. List the types of indexes in modern DBMSs and explain their purpose.
36. Explain the difference between unique and non-unique indexes. Provide examples.
37. Define a transaction in a DBMS and explain its purpose and functions.
38. Define a transaction in a DBMS and explain the ACID properties of transactions.
39. Define a transaction in a DBMS and provide examples of possible anomalies during concurrent transaction execution.
40. Define the locking mechanism in a DBMS and explain its purpose.
41. Define database normalization and explain its purpose.
42. Explain the difference between the unnormalized form (UNF) and the first normal form (1NF).
43. Describe the process of bringing a table to 1NF. Provide an example.
44. Explain the essence of partial functional dependency and its purpose.
45. Define the second normal form (2NF) and explain its purpose.
46. Define the second normal form (2NF) and describe the algorithm for table decomposition when moving to 2NF.
47. Define full functional dependency and explain its purpose.
48. Explain the concept of transitive dependency and its purpose.
49. Define the third normal form (3NF) and explain its purpose.
50. Define the third normal form (3NF). Characterize the process of table decomposition when moving to 3NF.
51. Define the Boyce–Codd Normal Form (BCNF) and explain its purpose.
52. Define 3NF and BCNF and explain the main differences between them.
53. Define 3NF and BCNF and provide an example of a relation that is in 3NF but not in BCNF.
54. Define 2NF and 3NF and provide examples of anomalies eliminated by moving from 2NF to 3NF.
55. Define the Boyce–Codd Normal Form (BCNF) and describe the conditions under which it is necessary to bring a relation to BCNF.
56. Define the Boyce–Codd Normal Form (BCNF) and explain the algorithm for table decomposition when moving to BCNF.
57. Define the Boyce–Codd Normal Form (BCNF) and provide an example of a relation that satisfies the requirements of BCNF.
58. Define semantic modeling and explain its purpose.
59. Define the concept of an ER diagram, explain its purpose, and describe its main elements (entity, attribute, relationship).
60. Define the concept of an ER diagram. Provide an example of building an ER diagram for the subject area "Wholesale Company."

12. Educational and methodological software

Educational process in the discipline " Databases " completely and in sufficient quantities provided necessary educational and methodological literature . In particular , teachers departments prepared and published such works :

– DataBase: methodological recommendations for laboratory work for applicants of the first (bachelor) level of higher education, specialty F2 " Software engineering" = Databases: methodological recommendations for laboratory work for applicants of the first (bachelor) level of higher education, specialty F2 "Software engineering" / N.I. Pravorska , Y.V. Forkun , V. O. Boyko. Khmelnytskyi : KhNU, 2025. 120 p. (English, Ukrainian).

13. Hardware and software software disciplines (if necessary)

Information and computer support : PC, tablet, smartphone or another mobile device , projector . Software software : programs Microsoft Office or similar , network access Internet , working with presentations .

Study educational doesn't need discipline using special software application software , cr them commonly used programs and operating systems.

14. Recommended reading

Basic:

1. DataBase : methodological recommendations for laboratory work for applicants of the first (bachelor) level of higher education , specialty F2 " Software engineering " = Databases: methodological recommendations for laboratory work for applicants of the first (bachelor's) level of higher education in the specialty F2 "Software Engineering" / N.I. Pravorska , Y.V. Forkun , V. O. Boyko. Khmelnytskyi: KhNU, 2025. 120 p. (English, Ukrainian).
2. Josephine Bush. Learn SQL Database Programming : Query and Manipulate Databases from Popular Relational Database Servers Using SQL. Packt Publishing. -2020 – pp..564
3. Alan Beaulieu Learning SQL: Generate , Manipulate , and Retrieve Data / Beaulieu Alan - O'Reilly Media 2020. - 377 pages .
4. Carlos Coronel . Database Systems : Design , Implementation , & Management (MindTap Course Letter) / Coronel Carlos , Morris Steven - Boston , Massachusetts : Cengage Learning - 14th edition , 2022 - 816 p.
5. Ying Bai . SQL Server Database Programming with Visual Basic.NET / Ying Bai - Wiley , 2020 - 688p.
6. Thompson Carter. Practical SQL Mastering Database Queries and Management. Independently Published. – 2024 – pp..206
7. Thompson Carter. Practical Guide to SQL and Databases. Independently Published. – 2024 – pp.. 248
8. Mark Simon. Getting Started with SQL and Databases: Managing and Manipulating Data with SQL. Apress. 2023 – pp.. 404

Support

9. Patni , Jagdish Chandra, and etc. Database Management System: An Evolutionary Approach. CRC Press , 2022. – 251 p.
10. SQL and NoSQL Databases. Second Edition. Michael Kaufmann, Andreas Meier/ Springer Cham, 2023. – 254 p. https://doi.org/10.1007/978-3-031-27908-9
11. SQL and NoSQL interview questions. Vishwanathan Narayanan. BPB PUBLICATIONS, [Sl .], 2023. – 178p.
12. Losev M. Yu . Base data : educational and practical self - help manual work of students / M. Yu . Losev , VV Fedko . – Kharkiv : KHNEU named after S. Kuznets , 2018. – 233 p. ISBN 978-966-676-731-1
13. Khariv NO Kh 20 Base data and information systems : educational guide / NO Khariv . - Rivne : NUVHP, 2018. - 127 p.
14. A workload-driven method for designing aggregate-oriented NoSQL databases. Liu Chen, Ali Davoudian , Mengchi Liu. Data & Knowledge Engineering Volume 142 , November 2022, 102089
15. Designing NoSQL databases based on multiple requirement views. Roy- Hubara , Arnon Sturm,

Peretz Shovel . Data & Knowledge Engineering Volume 145 , May 2023, 102149
16. Security & privacy issues and challenges in NoSQL databases. Sabrina Sicari , Alessandra Rizzardi , Alberto Coen-Porisini . Computer Networks Volume 206 , 7 April 2022, 108828
17. A unified metamodel for NoSQL and relational databases. Carlos J. Fernández Candle , Diego Sevilla Ruiz, Jesus J. García -Molina. Information Systems Volume 104 , February 2022, 101898
18. Databases. Methodical guidelines for course design for students of the "Software engineering" training direction / Yu. V. Forkun , . – Khmelnytskyi : KhNU , 2023. - 28 p.
19. Gerardus Blokdyk Database Design Best Practices A Complete Guide. The Art of Service- 2023 Edition. - 294 p.
20. Ben Forta . MySQL Crash Course. Addison-Wesley Professional; 2nd edition – 2023 – 304 p.
21. Праворська Н.І, Супрун П.К. Автоматичне відновлення та ідентифікація стуну під час застосування шаблону SAGA для транс акційного виконання операцій, пов'язаних з базами даних в мікросервісному середовищі.– Вісник ХНУ, серія Технічні науки, N 5 , 2025
22. Форкун Ю., Мартинюк В., Праворська Н., Лучицький О. Метрика диференційованої цикломатичної складності аналізу програмного коду з використанням систем керування базами даних. Measuring and computing devices in technological processes. 2023. №3. С. 100–105.

15. Information resources

Electronic University :

1. A modular learning environment. Access to the resource: https://msn.khmnu.edu.ua/course/view.php?id=9995
2. Electronic library of the university. Access to the resource: http://library.khmnu.edu.ua/
3. Repository of KhNU . Access to the resource: https://elar.khmnu.edu.ua/home