"Халықаралық ақпараттық технологиялар университеті" АҚ

АО "Международный университет информационных технологий"

Faculty of Computer technology and cybersecurity

Department of Cybersecurity

«APPROVED»
Dean of faculty
_____ N.A. Seilova
«_29_» _August_ 2025

WORKING CURRICULUM OF THE DISCIPLINE (SYLLABUS)

Course: _SFT6211 - Organization of database management systems____

Group of educational programs: _____B058-Information security

Educational program: 6B06301- Computer security, 6B06302-Hardware security, 6B06303-Network security

Year: __3__ **Semester:** _5___ **Number of academic credits:** ___4_

Lectures:	____15___	hours
Practical work:	____15___	hours
Laboratory work:	_____15__	hours
IWST:	___15____	hours
IWS:	___60__	hours
TOTAL:	____120___	hours
Cycle of discipline:	_____Basic__ (General education/Basic/Major)	
Form of control:	Test	

Almaty 2025

«IITU» JSC

The working curriculum of the discipline (syllabus) _) SFT6211 - Organization of database management system
has been developed on the basis of the educational program 6B06301 - Computer Security, 6B06302-Hardware Security, 6B06303-Network security

The working curriculum of the discipline (syllabus) has been reviewed at the meeting of Cybersecurity department.

Minutes №. 1 **dated «**26**»** August **20**25

Head of the Department _____ **Yeskendirova D.M.**
signature *full name*

Author _____ **Dauletbek M.O.**
signature *full name, title, degree*

The working curriculum of the discipline (syllabus) was approved at a meeting of the Faculty's Academic Quality Council.

Minutes № 1 **dated "**29**"** August **20**25

Agreed:

Head of the Department of the Educational and Methodological activities _____ **Ajibayeva A.**

Library _____ Сергеенбаева Н.
(Full name and position)

1. General information	
Faculty	Faculty of Computer technology and cybersecurity
Code and name of the educational program (EP)	B058-Information security
Program level (bachelor's, master's, PhD)	**bachelor**
Year, semester	3,5
Name of the discipline	Organization of database management systems
Cycle of the discipline	General education/Basic/Major
Number of academic credits	4
Prerequisites	Information and communication technologies
Postrequisites	Diploma project
Lecturer	Dauletbek M.O, Senoir lecturer, m.dauletbek@edu.iitu.kz, office 402, Baizak center, 4th floor
Teachers who conduct practical or laboratory classes	Dauletbek M.O, Senoir lecturer, m.dauletbek@edu.iitu.kz, office 402, Baizak center, 4th floor

2. Goals, objectives and learning outcomes of the course

The course goal is learning the basic principles of designing database and work with database management systems

The objectives of the course are to:

- **Understand Database Concepts: Learn key concepts such as data models, normalization, database architecture, and transaction management.**
- **Design Databases: Gain proficiency in designing databases using Entity-Relationship diagrams and converting them into relational models.**
- **Implement Databases: Develop skills in implementing databases using SQL and other database management tools.**
- **Optimize Performance: Understand and apply techniques for optimizing database performance, including indexing and query optimization.**

Handle Real-world Scenarios: Analyze case studies to understand real-world applications and challenges in database design.

Learning outcomes

- Explain Fundamental Concepts: Clearly articulate key principles of database systems and their applications.
- Design Efficient Databases: Create efficient and normalized database schemas based on given requirements.
- Implement and Manage Databases: Build and manage databases using SQL and other relevant database management systems.
- Analyze and Optimize Performance: Analyze database performance issues and implement optimization strategies.
- Apply Knowledge to Real-world Problems: Apply theoretical knowledge to solve practical database design problems in various business or technical contexts.

Competencies:

3. Course description

Course Description: In this course Organization of database management systems students will delve into the core principles of database systems, learning how to effectively design, implement, and manage databases. The curriculum covers essential topics such as data modeling, relational database design, SQL, and optimization techniques. Through a blend of theoretical knowledge

and practical application, students will gain hands-on experience in creating efficient database systems. This course is ideal for aspiring database administrators, software developers, and IT professionals seeking to enhance their skills in database management. Upon completion, participants will be equipped with the knowledge and tools necessary to tackle real-world database design challenges in various professional settings.

4. Методы преподавания

Teaching methods:

5. Course policy

Students are not allowed to use cell phones during classes, browse the social networks and play on-line games. Cheating will not be tolerated. Students caught cheating will receive a "0" for the assignment.

Attendance/participation is assessed based on the number of lessons attended by students. Each student must attend 80% of all lessons, or she/he won't be eligible to pass final exam.

The student gains points for each performed assignment, including laboratory works. If student misses classes, he/she will not be able to gain mark, unless he/she will perform and defend the assignment during office hours or additional classes. In case the student is not able to attend the lessons for some reason, he will be responsible for learning all material, which was learnt during unattended lessons. If the student did not attend more than half of the lessons without reasonable excuse, the teacher has a right to mark him as "not graded", and the student will not be admitted to exam. Online platform MS Teams.

- platforms and services for conducting classes: Microsoft Teams, platonus.iitu.edu.kz

- list of recommended MOOC courses for the complete mastering of the discipline:

https://www.coursera.org/specializations/data-design-operational-business-intellegence?

https://www.coursera.org/learn/relational-database-design

https://www.coursera.org/learn/introduction-to-databases

6. Academic Integrity

- Plagiarism and Other Violations Policy

All forms of academic dishonesty are strictly prohibited. Plagiarism — the use of another person's work, ideas, or text without proper citation — is considered a serious violation of university ethics. This includes copying from other students, published sources, online materials, or AI-generated content without proper acknowledgment.

Students must submit only their own original work for laboratory reports, practical assignments, and independent projects. Any evidence of plagiarism, unauthorized collaboration, cheating during assessments, or falsification of data will result in disciplinary action, including a score of "0" for the assignment and potential academic penalties according to IITU regulations.

To maintain fairness, all written work may be checked using anti-plagiarism and AI-detection tools. The acceptable similarity index for written assignments is **no more than 20%**, excluding references.

- **Code of Academic Integrity (including the use of Artificial Intelligence)**

Students are expected to adhere to the following principles:

1. **Honesty and Responsibility**
   - Perform all assignments independently unless group work is explicitly allowed.
   - Use AI tools (e.g., ChatGPT, Copilot, etc.) only for learning support, brainstorming, or code explanation — *not* for full assignment generation.
2. **Ethical Use of AI**
   - AI tools may be used to **improve understanding** of theoretical concepts, **debug code**, or **analyze database queries**, provided that the student can **explain and defend** all results.
   - Direct submission of AI-generated reports, code, or SQL queries without modification, understanding, or citation will be treated as **academic misconduct**.
   - When AI tools are used for assistance, students must include a **short note of acknowledgment** (e.g., "Assistance with syntax checking and explanation was received using AI tools").
3. **Transparency and Accountability**
   - Each student must be able to justify and reproduce the results of their laboratory or project work upon request.
   - Misrepresentation of AI-generated work as personal work undermines learning objectives and violates academic integrity standards.
4. **Respect for Others' Work**
   - Proper citation of all references, including online tutorials, research papers, and code samples, is mandatory.
   - Collaboration should promote mutual learning but not result in identical submissions.

7. Literature

Basic literature:

1. Connolly, Thomas M. (2010). **Database** Systems : a Practical Approach to Desing, Implementation, and Management.
2. Elmasri, R., & Navathe, S. B. (2014). Fundamentals of Database Systems (7th ed.). Pearson.
3. **Latest Oracle Database** Advanced PL/SQL Exam 1Z0-148 Questions and Answers : учебное пособие. - USA : IT Pass, 2020.
4. Davidson, L. (2021). Pro SQL Server Relational **Database** Design and Implementation. Sixth Edition

8. Forms of control and assessment

№	Type of work	Form of control	Evaluation criteria
1.	Laboratory works, Practical task	Laboratory works, Practical task	Accuracy, completeness, and understanding of the topic
2.	Mid-term	**MCQ**	Correctness of answers, conceptual understanding
3.	Laboratory works, Practical task	Laboratory works, Practical task	Correct execution, clarity, and timely submission
4.	End-of-term	**MCQ**	Correctness of answers, conceptual understanding
5.	Types of Independent Student Work (for example: ISW 1,2 – Project)		
6.	Final assessment	**TEST**	Correctness of answers

9. System for evaluating student performance in a discipline:

Each type of academic work is assessed on a 100-point scale in accordance with the table.
Example

Period	Assignments	Score
1st attestation	Laboratory works	100
	Practical classes	100
	...	100
	Mid-term	100
2nd attestation	Laboratory works	100
	Practical classes	100
	End-of-term	100
	Exam	100
TOTAL	**0,3*PK1+0,3*PK2+0,4*Exam**	

10. Course schedule

Week/ date	Course topics	References	Lectures (h/w)	Practical sessions (h/w)	Lab. sessions (h/w)	IWST (h/w)	IWS (h/w)

1.	Introduction to Database Systems	Basic [1] Suppl. [1]	1	1	1	1	6
2.	Database System Architecture and Data Independence	Basic [2] Suppl. [1]	1	1	1	1	6
3.	The Entity-Relationship Model	Basic [3] Suppl. [3]	1	1	1	1	6
4.	Database Design and Normalization	Basic [2] Suppl. [1]	1	1	1	1	6
5.	SQL I: Data Definition Language (DDL) and Basic Data Manipulation Language (DML)	Basic [2] Suppl. [1]	1	1	1	1	6
6.	SQL II: Advanced Data Manipulation Language (DML) and Data Query Language (DQL)	Basic [2] Suppl. [1]	1	1	1	1	6

7.	Normalization and Database Design	Basic [3] Suppl. [1]		1	1	1	6
8.	Relational Algebra	Basic [3] Suppl. [1]	1	1	1	1	6
9.	Queries	Basic [5]	1	1	1	1	6
10.	Queries and Aggregate Functions in SQL	Suppl. [1]	1	1	1	1	6
11.	Nested queries	Basic [4]	1	1	1	1	6
12.	CTE. Views	Suppl. [2]	1	1	1	1	6
13.	Simulation multy-channel models	Basic [3]	1	1	1	1	6
14.	Final exam preparation	Suppl. [1]	1	1	1	2	6
15.	Conclusion			1	1	1		6
Total hours:		**120**	**15**	**15**	**15**	**60**	**120**

11. List of topics/assignments for laboratory classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
1.	Laboratory 1: Subject Area Analysis (University database, individual work)	1	Basic [1], [2] Supplementary [1]	Report	Week 2
2.	Laboratory 2: Conceptual Design (University database, individual work)	1	Basic [1], [2] Supplementary [1]	Report	Week 3
3.	Laboratory 3: Logical design (University database, individual work)	1	Basic [1], [2] Supplementary [1]	Report	Week 4

4.	Laboratory 4: Physical Design (SQL. DDL) (University database, individual work)	1	Basic [3] Supplementary [1]	Report	Week 5
5.	Laboratory 5: Content (SQL. DML) (University database, individual work)	1	Basic [3] Supplementary [1]	Report	Week 6
6.	Laboratory 6: Relational algebra (University database, individual work)	1	Supplementary [1]	Report	Week 7
7.	Laboratory 7: Queries (University Database Individual Work)	1	Basic [1], [2]Supplementary [1]	Report	Week 9
8.	Laboratory 8: Advanced queries (University Database Individual Work)	2	Basic [1], [2] Supplementary [1]	Report	Week 10
9.	Laboratory 9: Nested Queries (University Database Individual Work)	2	Basic [1], [2] Supplementary [1]	Report	Week 11
10.	Laboratory 10: Views (University Database Individual Work)	2	Basic [3] Supplementary [1]	Report	Week 12

12. List of topics/assignments for practical classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
1.	Practice 1: Project Part 1. Subject Area Analysis (individual topic, teamwork)	2	Basic [1], [3] Supplementary [1]	Report	Before midterm 1
2.	Practice 2: Project Part 2. Conceptual Design (individual topic, teamwork)	2	Basic [2], [3] Supplementary [1]	Report	Before midterm 1
3.	Practice 3: Project Part 3. Logical Design (individual topic, teamwork)	2	Basic [4], [5] Supplementary [1]	Report	Before midterm 1
4.	Practice 4-5: Project Parts 4-5. Physical Design and Content (individual topic, teamwork)	2	Basic [1], [2] Supplementary [1]	Report	Before midterm 2
5.	Practice 6: Project	2	Basic [1]	Report	Before midterm 2

	Part 6. Queries (individual topic, teamwork)		Supplementary [1]		
6.	Practice 6: Project Part 7. Defense (individual topic, teamwork)	3	Basic [1], [2] Supplementary [1]	Report	Before midterm 2

13. List of topics/assignments for student's independent work

Proper organization of students' independent work is the key to the formation of skills in mastering, learning, assimilation and systematization of acquired knowledge, ensuring a high level of academic performance in the learning process.

№	Topic/Assignment title	Number of hours	References	Form of reporting	Deadline
1.	Comparative Study of SQL and NoSQL Databases	4	Supplementary [1]	Report	Before midterm 1
2.	Data Warehousing and Data Mining Techniques	4	Supplementary [1]	Report	Before midterm 1
3.	Implementation of CRUD Operations in MongoDB	4	Supplementary [1]	Report	Before midterm 1
4.	Performance Tuning in MySQL	4	Supplementary [1]	Report	Before midterm 1
5.	Security Measures in Database Management Systems	4	Supplementary [1]	Report	Before midterm 1
6.	Indexing and Query Optimization	4	Supplementary [1]	Report	Before midterm 1
7	Introduction to Oracle PL/SQL	4	Supplementary [1]	Report	Before midterm 1
8	Data Modeling with UML	4	Supplementary [1]	Report	Before midterm 2
9	Study of Transactions and Concurrency Control	4	Supplementary [1]	Report	Before midterm 2
10	Database Backup and Recovery Strategies	4	Supplementary [1]	Report	Before midterm 2
11	Study of XML and JSON in Databases	4	Supplementary[1]	Report	Before midterm 2
12	Big Data Analytics and Hadoop Ecosystem	4	Supplementary [1]	Report	Before midterm 2
13	Cloud Database Management Systems	4	Supplementary [1]	Report	Before midterm 2
14	Introduction to Distributed Databases	4	Supplementary [1]	Report	Before midterm 2
15	SQL Injection and Database Vulnerabilities	4	Supplementary [1]	Report	Before midterm 2

14. Assessment criteria

The point-rating letter system for assessing the educational achievements of students with their interpretation in the traditional grading scale:

Letter system assessment	The digital equivalent of points	Percentage content	Traditional system assessment	General description of grading criteria
A	4,0	95-100	Excellent	The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; shows a high level of knowledge that exceeds the volume provided by the syllabus, gives an exhaustive answer
A-	3,67	90-94		The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; gives an exhaustive answer
B+	3,33	85-89	Good	The student shows a complete, well-founded knowledge of the subject, but the answers did not always highlight the main idea, rational methods of calculation were not always used; the answers were mostly brief and sometimes unclear.
B	3,0	80-84		
B-	2,67	75-79		
C+	2,33	70-74		
C	2,0	65-69	Satisfactory	The student demonstrates sufficient knowledge of the subject, but without proper depth and justification, the answers are unclear and without proper logical sequence.
C-	1,67	60-64		
D+	1,33	55-59		
D	1,0	50-54		
FX	0,5	25-49	Unsatisfactory	The student demonstrates insufficient knowledge of the subject, positive answers were not given to individual questions.
F	0	0-24		The student demonstrates a very low level of knowledge of the subject.

15. Assessment and evaluation materials (exam questions)

1. What does SQL stand for?
A. Structured Query List
B. Simple Query Language
C. Structured Query Language
D. Sequential Query Language

2. Which of the following is a NoSQL database?
A. Oracle

B. MySQL
C. MongoDB
D. SQL Server

3. Normalization in databases is mainly used for:
A. Increasing storage efficiency
B. Improving performance
C. Reducing data redundancy
D. Enhancing security

4. Which SQL statement is used to extract data from a database?
A. GET
B. SELECT
C. EXTRACT
D. OPEN

5. What does 'ER' stand for in 'ER Model'?
A. Entity-Relationship
B. Efficient-Relational
C. Entity-Revised
D. Extended-Relationship

6. A primary key:
A. Can be null
B. Can contain duplicate values
C. Uniquely identifies each record
D. Can be a foreign key in another table

7. Which of the following is not a type of SQL join?
A. INNER JOIN
B. OUTER JOIN
C. DIRECT JOIN
D. LEFT JOIN

8. Which command is used to remove a table from a database?
A. REMOVE TABLE
B. DROP TABLE
C. DELETE TABLE
D. CUT TABLE

9. In a relational database, a relationship is established between two tables by:
A. Primary keys
B. Secondary keys
C. Foreign keys
D. Unique keys

10. What is the purpose of the 'HAVING' clause in SQL?
A. To specify a condition for grouping records
B. To join tables
C. To sort the result-set
D. To insert new records

16. Introducing students to the syllabus

I have read and agree with the requirements of the discipline «Organization of database management systems».

№	Full name of the student	Signature	Date
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