CURRICULUM

Confirmed:
Dean:

CS204

DATABASES

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ANNOTATION

The Databases course is a basic course for majors in the field of Computer Science. The course covers topics related to the main directions in the development of databases technology. Particular attention is paid to relational systems and methods for ensuring efficient processing of user requests. Within the course, students study basic paradigms related to database programming (i.e., how to search the database and modify it) and acquire basic knowledge about the administration and management of databases based on the Microsoft platform SQL Server.

BASIC PURPOSES

The main goal of the course is to introduce students to the fundamental concepts and principles of databases, with approaches to the normalization of relational schemas, as well as to form basic knowledge of the principles, methods and approaches of data description and processing, for effective search in the database and its modification. Specifically, students should: • understand the essence of the basic concepts related to data modeling; • to know the main types of data models and their features; • to know the mechanism of operation of the main components of a database management system and how they interact; • be able to build relational database models; • to normalize relational schemas of relational databases; • to be able to solve specific tasks when working with specific databases using Microsoft SQL Server tools.

PREREQUISITES

The acquired knowledge and skills within the disciplines "Programming", "Object Oriented Programming", "Theory of Algorithms" and "Discrete Mathematics" are a solid background for achieving effectiveness and efficiency of learning within this introductory course related to the technology "Bases of data'.

STATUS AND STRUCTURE

PROGRAMME	status	ECTS	Full time				Part time			
			л	с	у	общ	л	с	у	Общ
Computer Science	Mandatory	6	30	30		60	15	15		30
Software Engineering	Mandatory	6	30	30		40	15	15		30
Computer Systems and Technologies	Mandatory	6	30	30		40	15	15		30
Electric Energy Distribution and Electrical Equipment	Elective	6	30	30		40	15	15		30
System engineering in industry and tourism	Optional	6	30	30		40	15	15		30

COURSE CONTENT

Topic 1. Traditional approach: file systems. A "database" approach. Integrity, completeness, independence, sustainability of data. Conceptual diagram and internal diagram in the "databases" approach. Logical and physical database.

Topic 2. Purpose and requirements for DBMS. DBMS architecture. Basic components. Functional diagram. Types of DBMS users.

Topic 3. Logical model of a database. Objects and their descriptions. Types of relationships between data. Relationships between classes of entities. Data description languages and data constraints. Data processing languages.

Topic 4. Network data model. Structure diagram. Representation of M:N relationships. Data definition and processing.

Topic 5. Hierarchical data model. Definition tree. Basic questions related to representation of M:N connections and network structures.

Topic 6. Relational data model. A relationship. Basic concepts. Representation of 1 : 1, 1 : N, M : N relationships and network structures.

Topic 7. Relational scheme. Primary (master), secondary and foreign keys. Data Integrity Limitations. Database status. Designing relational databases.

Topic 8. Analysis of relational schemes. Functional dependencies and logical consequences. Normalization of relational schemas. Defining the first, second, and third normal forms of a relational schema.

Topic 9. Object-oriented data model. Object-relational data model. ORM model. Advantages of the object model.

Topic 10. Classification of relational languages. Languages of relational calculus, languages of relational algebra and intermediate languages. The query as a logical expression on the objects defined in the database schema.

SEMINARS

Topic 1. SQL – language for data description. Basic operators for creating, modifying and deleting tables and virtual tables..

Topic 2. SQL as a language for data processing. Database update operators. General Structure of a Data Search Query. Relational completeness of language.

Topic 3. Physical organization of databases. Basic data access methods.

Topic 4. Creating and managing SQL Server databases - system databases, database files, creating, modifying, moving, backing up, deleting databases

Topic 5. Using SQL to define data. Limiting data values.

Topic 6. Using SQL to retrieve data from tables.

Topic 7. Summarizing data using aggregate functions. Functions for working with character strings. Using expressions. Conditional expressions.

Topic 8. Joins of tables. Cross requests. Data aggregation. Using the union, intersection, and difference operators.

Topic 9. Indexes - types, creation, modification, deletion. Analyzing and optimizing data access.

PLANNED LEARNING ACTIVITIES AND TEACHING METHODS

Training methods:

Face-to-face lectures and seminars

Visual learning

Practical Education

Interactive learning

E-learning through the Moodle platform

Teaching tools:

Self-paced work

Educational video materials incl. video presentations

Practical tasks

Programming tasks using application software

Use of electronic resources in the Moodle platform: theoretical materials, presentations, sample programs, tests and tasks for self-paced work on each topic

COURSEWORK

The course assignment is assigned to each student and contains tasks on analysis and assessment of current information security problems. It is chosen by the student and consulted with the teacher. Each student presents his course assignment and receives a grade characterizing the level of mastery of the learning material.

ASSESSMENT METHODS

- Each student develops a personal course assignment, representing a study of a specific problem in the field of information security. The task includes independent development of a certain topic from the subject of the discipline. The implementation and protection of the development are evaluated - up to 30 points. The criteria for evaluating the development are: originality, thoroughness of the research, complexity of the topic, presentation of the development.
- For original ideas presentation - up to 10 items.
- Up to 6 points are awarded for attendance and participation in the exercises.
- The exam is written and is a test with open-ended questions, which is evaluated with a maximum of 54 points. The final evaluation includes the total of ongoing control of the seminar exercises, an evaluation of the course work and an evaluation of the written exam. To form the grade, the student collects points, the maximum value of which is 100. The final grade is formed by distributing the points on the scale:

1. Face-to-face assessment…….. …….. …… 16 points

1.1. Control work - 10 points

1.2. Seminars - 6 points

(presence and participation in seminars)

2. Outside classroom employment …….. …….. …. 30 points

2.1. Course assignments – 2 pcs. - 20 points

2.2. Homework - 10 points

3. Final exam…….. …….. 54 points

The student must have a minimum of 14 points from the control during the semester and a minimum of 22 points from the examination procedure in order to form a comprehensive assessment. The final grade is formed by distributing the points on the scale:

• from 54 to 60 points - Medium (3);

• from 61 to 70 points - Good (4);

• from 71 to 80 points - Very good (5);

• from 81 to 100 points - Excellent (6).