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|  | **Course Syllabus** |

**1.** **Course Title:**

Databases and DBMS

**2. Academic Level:**

Bachelor

**3. ECTS Credits:**

5 ECTS

**4. Semester:**

4, spring semester

**5. School/Department:**

Institute of Computer Technologies and Information Security

**6. Location:**

Taganrog campus, 2 Chekhova St., Taganrog

**7. Instructor:**

Associate Prof. Sergei Kucherov, email: [skucherov@sfedu.ru](mailto:skucherov@sfedu.ru)

**8. Language of Instruction:**

English

**9. Course Description:**

The course is aimed at obtaining knowledge, skills, and abilities in the field of design and development of relational databases. The course deals with models and principles of data structuring, modern approaches to organizing data storage. The main emphasis is on relational technologies and the SQL language

**10. Course Aims:**

- to study of database design methods, modern database management systems and gaining practical skills in working with modern databases;

- to gain experience in one of the modern DBMS and gaining knowledge, skills and abilities in the field of database design and administration, database software development.

**11. Specific entry requirements (if any):**

To successfully master this course, a student needs to have basic knowledge and skills in the following areas of knowledge:  
- Algorithmizing and programming

- Discrete Mathematics

**12. Course Content:**

Module 1. Basic concepts of DB and DBMS.

- Purpose and main components of the database system. Relational and NoSQL Databases: Layers of Database Presentation. An overview of the main approaches to structuring and modeling data: network, hierarchical, graph, relational and document-oriented data models.

- Database design. Database architecture. Data models. Hierarchical, network, relational data models. Entity-relationship model. Design levels: conceptual, logical, physical. Database design based on the principles of normalization.

- Mathematical foundations of relational data manipulation. Single-circuit and non-circuit relationships. Basic operations of relational algebra. Traditional and specialized operations.

- SQL language. Relational data model. Operations on relationships. Relational algebra. The structure of the SQL language. DDL data definition statements. DDL data manipulation operators. DQL Query Language. Data types. SELECT statement. Queries: simple, using joins, nested queries. Standard functions.

- Distributed data processing. Remote data access model. Parallel processes. Transaction model. Transaction properties. Problems of parallel processes. Transactional conflicts and ways to resolve them. Database security.

Module 2. Database Management Systems.

- MS SQL Server architecture. Installing and configuring MS SQL Server. Basic Transact-SQL Concepts.

- Working with MS SQL Server databases.

- Working with MS SQL Server tables.

- Fetching MS SQL Server data. Adding, changing, and deleting data.

- Indexing. Representation. Cursors.

- MS SQL Server transactions.

- Stored procedures, user-defined functions, MS SQL Server triggers.

- Administration of MS SQL Server.

- Post-relational and NoSQL DBMS: PostgreSQL, Redis, Neo4J, MongoDB: Features and purpose, main differences from relational DBMS.

**13. Intended Learning Outcomes:**

To understand:

‒ terms and definitions of methods and means of Databases and DBMS;

‒ modern technologies for structuring and storing data

‒ graphic notations used in database design

‒ data models, main advantages and disadvantages, and application areas

‒ principles of fetching data from relational databases

‒ principles and criteria of optimality of SQL queries

To apply:

‒ design of databases for storing information

‒ writing SQL queries, stored procedures, triggers

‒ development of database objects

‒ structure data in accordance with the specifics of the subject area and software requirements

‒ algorithmization of data manipulation procedures in databases

‒ debugging and optimizing SQL queries

To explain:

‒ work with the SQL language

‒ work in modern relational database management systems

‒ development of documentation for databases and database objects

‒ development of procedures and functions in the Transact-SQL language

**14. Learning and Teaching Methods:**

**15. Methods of Assessment/Final assessment information:**

During the course: assessment of laboratory works and two tests. Final assessment – practical exam

Lecture, tutorial, demonstration, laboratory work

**16. Reading List:**

C.J. Date. 2003. An Introduction to Database Systems (8th. ed.). Addison-Wesley Longman Publishing Co., Inc., USA.

Kuznetsov S. Introduction to relational databases / S. Kuznetsov - 2nd ed., corrected. - Moscow: National Open University "INTUIT", 2016. - 248 p.

I.Yu. Bazhenov - 2nd ed., corrected. - Moscow: National Open University "INTUIT", 2016. - 238 p. Bibliographic record of the source No. 2 of the main literature