Groupwork Activity

Development of a Modern Database

General information

Form of evaluation:	Defense of the project made by the team in front of the group, including presentation and discussion of the results from each project stage.
Place of presentation:	At the Seminar exercises of the group.
Required documents:	Project presentation (in PPTX format), project documentation (in electronic form as PDF or DOCX document), archive containing the export of the structure and content of the database.
Deadline for submission:	Week 12-13
Deadline for presentation:	Week 12-13

Remarks

1. Each team member must participate preparation of preliminary research, presentation, documentation, database development and report of the results!

2. Copy of all of the required documents must be send to rmiltchev@ict.academy, before team defense.

Introduction to the problem

Create a team of your colleagues in course (between 3 and 5 team members) to develop a comprehensive database design in a specific subject area. The project variant for each team will be chosen randomly, with one team representative downloading the lecture version from the Introduction to Databases course. The database design and development should follow the following standard stages:

- Requirements Analysis
- Conceptual Design
- Logical Design
- Physical Design
- Testing and Evaluation
- Deployment
- Maintenance and Monitoring

Stage 1 tasks. Requirements Analysis

- Identifying the purpose and scope of the database – what data needs to be stored and why.
- Determining what applications will use the database – this helps anticipate future data access needs.
- Identifying crucial entities, attributes, relationships, and constraints for the data model.

Stage 2 task. Conceptual Data Modeling

- According to business requirements try to identity core entities.

- Determining the attributes for each entity – these are characteristics that describe or qualify the entity.
- Defining relationships between entities, such as one-to-one, one-to-many, or many-to-many.
- Representing the entities and relationships using modeling methodologies like entity-relationship diagrams.

Stage 3 tasks. Logical Database Design

- Mapping conceptual model entities and attributes to database tables and columns.
- Establishing primary keys and foreign keys to represent relationships and enforce referential integrity.
- Normalizing the table structure through techniques like removing redundant attributes.

Stage 4 tasks. Physical Database Design

- Researching what other DBMS technologies could be used except MySQL to create a full feature working database.
- Defining the database, tablespaces, files, and physical storage parameters.
- Implementing the table and column definitions using DBMS syntax into MySQL DBMS environment.
- Specifying data types, keys, constraints, triggers, and other constructs.

Stage 5 tasks. Database Implementation

- Use of Data Definition Language (DDL) statements to create the database, tables, indexes, keys, triggers, procedures, and other elements designed in the physical model.
- Loading initial master data or reference data needed by the applications.
- Testing the database operations and performance using dummy data.
- Finalizing documentation for the database schema, processes, security model etc.

Stage 6 tasks. Testing and Quality Assurance

- Checking that all objects are implemented accurately based on the physical design.
- Validating that the correct data is stored and retrieved as expected.
- Create from 5 to 10 production scenarios based on different types SQL queries derived from the purpose and business requirements studied at Stage 1.
- Using randomly generated test data and dummy records to simulate production scenarios.
- Performing SQL queries, procedures, and transactions to verify functionality.
- Fixing any bugs or issues before final deployment.

Stage 7 tasks. Maintenance and Monitoring

- Planning disaster recovery plan and procedures.
- Evaluation of influence of the future database schema changes and evolution.
- Planning backups execution time
- Creating backup of database structure and content
- Enforcing the security and access controls.

Table 1. Description of project variants.

Variant	Project name	Base entities
1	University Management System	Students, Faculties, Courses, Dormitories, Subjects
2	Online Railway Reservation System	Train, User, Route, Class, Ticket, Payment
3	Hospital Management System	Patient, Doctor, Bill, Room, Services
4	Banking Management System	Bank, Branch, Customer, Employee, Account, Payments
5	Library Management System	Books, Authors, Publishers, Employees, Members
6	Online Shopping System	Products, Categories, Roles, Customers, Orders, Payments
7	Hotel Reservation System	Rooms, Services, Employees, Customers, Payments
8	Online Movie Booking System	Movies, Theatres, Tickets, Orders, Customers
9	Chat Application	Users, Messages, Chats, Notifications, Attachments

Remarks: One of the team members will randomly draw the team project number. The drawing will take place at lectures!