

BIM312 – Database Management Systems Term Project

**For the term project, you were required to work as a group of two.
Don't forget that you should continue with the group project (topic)
that is assigned to you at the beginning of the semester, thus you are
not allowed to change your topic.**

Due Dates of Project Deliverables

Due Date for “Phase 1” – April, 3

Due Date for “Phase 2” – May, 1

Due Date for “Phase 3” – May, 29

As a DB-Engine, you can use either MySQL, or Microsoft SQL Server.

Note: “Microsoft Access” is not an accepted DB-Engine.

Project Overview

This term project will give you a real hands-on experience by using a full-fledged database management system. You will design and implement a database application, which will include an application program (web application or desktop application) and a supporting database. The term project includes the following activities spread over the entire semester:

1. Determine the functionalities and operations of your database application. Think about the various requirements for the user of your application and the various data attributes that need to be stored and later queried (consider factors such as the need to store and query large data volumes, support multiple users, provide concurrent access, maintain consistency, etc.). So, the starting point of your project is to explore questions such as:
 - What is the purpose of the database? What should it do?
 - Who are the users and what are their information needs?
 - What are the problems that the system should solve?
 - What input data is available to the database?
 - What kind of information should be stored in the database?
2. Database development:
 - Model the data to be stored in your database, i.e., identify the various entities, relationships, constraints, etc.
 - Design, normalize, and perfect your relational database schema.
 - Write the SQL commands to create your database and tables.
 - Find appropriate data, and populate the database with at least 10,000 records.
3. Application development:
 - Develop your application program, which should have supporting codes to access the data from your DBMS.
 - Test your system and check if the application works as desired. Your project should "evolve" during the course of the semester, but for the most part, the functionality promised in the first deliverable must be achieved. For this purpose, make sure you perform a thorough requirement analysis at the beginning and balance features so you can "fulfill this contract" in the end.

The end result should be a functioning application that uses your underlying relational database to enable useful functionality.

Required Project Deliverables

Phase 1. Requirement Analysis & E/R Design

In this phase, you have two tasks. The first one is the requirement analysis step, and the second one is the E/R Diagram construction step.

➤ Phase 1 – Step 1: Requirement Analysis

In the first phase, your first task as an application developer and database designer is to identify the main data management needs of your assigned project topic. For example, explore and motivate its potential for interesting queries, and analyze the essential user functionality. You should ask yourself questions like

- What are the main functions that my application program should provide?
- How do the different functions work together?
- Which data are needed to support the necessary functions?

The focus of this project is supposed to be on the database part and not so much on the application part. This means that you should not design and implement highly sophisticated main memory algorithms but focus on database queries that evaluate large volumes of stored data. It is important that you demonstrate in your deliverable that your application would really benefit from database support and that new information can be derived from the stored data. A simple retrieval of data from the database or the connection of different tables is not sufficient. As an example, let us assume you have some kind of sales applications and store many sales numbers in your database. Of course, you can read and display them but this is not very exciting from a querying standpoint. More interesting queries are:

- What were the total monthly sales in 2018?
- Which item was sold most (so that we have to pre-order more of it)?
- Which item was a slow seller (and should therefore be removed from the inventory since it only wastes storage space)?
- How many items does the store have in stock?
- Provide a ranking of the customers based on the amount of money they spent in the store in last three months.

The answers to all these queries are not directly stored in the sales data. But they can be derived, that is, computed by database queries. Therefore, list a number of (at least five) database queries in your deliverable in order to show that your application has the potential to have such interesting database queries.

➤ **Phase 1 – Step 2: Entity-Relationship (E/R) Diagram**

Based on the requirement analysis that you specified in step 1, the goal of the second step is to describe the overall conceptual design of your term project. As for the conceptual database design, the task is to leverage the *Entity-Relationship (E/R) Model* that we learn in class. You should identify the important entity sets, relationship sets (cardinalities!), and attributes that are relevant and have later to be stored in the database in an E/R diagram. Please explain the important concepts of your diagram in detail.

Your first deliverable is supposed to be a detailed Word document that presents

- A clear and structured description and motivation of the assigned project topic and its requirements that you think your software solution should later fulfil. This means that you have to carefully deliberate on the requirements and functions and precisely describe them in your document.
- A detailed E/R diagram. For drawing the E/R diagram, you can use any suitable tool (e.g. Visio, Word, Draw.io, Lucidchart, etc.). Please give an overview and introduction of your ideas first and then the conceptual database design.

Please note that *only* the first submission of your first deliverable will be graded. If your first submission should not be satisfactory, a revision will be requested from you that will *not* be considered for (re)grading. This means, the more effort you put into the first submission, the lower the probability is that a revision is needed, and the more time you will have for the next deliverable. Please also note that it is *not* the task of this phase to determine the database schema of your solution.

Phase 2. Database Design

At this point, you should be rather clear how your software will look like, without having done any implementation yet. The clearer and more detailed you have performed the overall design, the simpler the implementation will be. In this phase, the mapping process presented in class is need to be applied to your E/R diagram in order to obtain the relational database schema. Please express your database schema as a list of SQL ***create table*** commands that include integrity constraints and that you can use directly in your DBMS. Present the database schema with additional explanations if they are needed in a Word document that represents this second phase. Please do not forget to include your (perhaps modified) ER diagram at the beginning of the Word document that is the input of the mapping algorithm.

Please note that only the first submission of your second deliverable will be graded. If your first submission should not be satisfactory, a revision will be requested from you that will *not* be considered for (re)grading. Please also note that it is *not* the task of this phase to provide any implementation (part) of your solution.

Phase 3. Final Project Demonstration

At the demonstration day(s), which will be near the end of the semester, your group have to present your complete software system. The time slots of the presentations will be announced you later. Demonstrations will be 10 minutes. Please, do not prepare any presentation (ppt document). You only need to demonstrate your program in details. *Don't forget, if you do not have any program or code (i.e., if you do not develop any application program), then there is nothing to be demonstrated.*

What to Submit?

Your work in each phase should be submitted through the Mergen system **within the deadlines. It is sufficient** for one member of the group to submit the assignment to the system.

For Phase-1 →

- Phase-1 Report (“word” file) including:
 - o A cover page (Group No, Project No-Name, Group members, Contribution of the group members)
 - o Requirement analysis
 - o E/R diagram (include a picture of your E/R diagram)
 - o At least 5 interesting queries
- The electronic version of your E/R diagram (Draw.io, Lucidchart, Visio are some tools you can use) must be sent as an attachment.

For Phase-2 →

- The electronic version of your “Corrected E/R diagram” (if needed according to phase-1 feedbacks)
- Your database file (XXX.sql) filled with some data
- Picture of your Relational Database Schema (you can get it from the DB-Engine that you used)
- Phase-2 Report (“word” file) including:
 - o A cover page (Group No, Project No-Name, Group members, Contribution of the group members)
 - o Description of your corrections that you made on your E/R diagram (if needed)
 - o Relational Database Schema (include a picture of your Relational Database Schema inside your report)
 - o The SQL commands to create your database and tables with some description). You can attach relevant files with .sql extension including commands for data insertion.

For Phase-3 →

- Your application program code and your database dump
- A file describing how to run your program ("*how_to_run.txt*")
- A detailed report describing your work through Phase1 to Phase3. Functionalities of your program with screenshots of your user interfaces (ex: adding new data, deleting some data, modifying some data, types of your users and their abilities, results of your advance queries (from Phase-1). Don't forget to include a cover page (Group No, Project No-Name, Group members, Contribution of the group members) to your final report.