School of Computer Sciences, USM, Penang

CMT221/CMM222: Database Organization and Design

PROJECT GUIDELINES

I. Overview

This document provides information and guidelines on how to prepare and implement the project for CMT221/CMM222: Database Organization and Design. The organization of the project guidelines is as follows:
Section I: Overview.
Section II: Project Objectives.
Section III: Project Group Formation.
Section IV: Case Study Assignment.
Section V: Project Implementation.
Section VI: Deliverables and Important Dates.
Section VII: Documentation Format and Guidelines.
Section VIII: Project Evaluation Rubrics.
Section IX: Contacts.
Section X: Appendix – Sample Cover Page.

II. Project Objectives

The project objectives are as follows:

- To guide students in developing a database application by practicing the knowledge and theories learned in class.
- To inculcate good database design practice.
- To inculcate collaboration and documentation using a cloud-based platform.
- To familiarize with one of the Database Management Systems (DBMS).

III. Project Group Formation

You are to work in a group of **four** members. No individual project is allowed. Group formation will be performed via eLearn@USM. Once the group is formed, one of the group members must be selected as the group leader. After you have confirmed your group on elearn, complete the following task:

- Go to the CMT221 Group Project padlet: https://padlet.com/jasy_yan/mlh45asfziroszxn. Create a post and suggest one project title your group would like to work on.

IV. Case Study Assignment

You are required to design and develop a database application for small and medium-sized enterprises (SMEs). Each group will be assigned a case study. A case study contains the business requirements and instructions of the database system your group will model, design and implement. We will try our best to assign your group a case study that closely match your project title suggestion. However, there is no guarantee that the case study assigned to your group exactly match the project title you have suggested. A case study can also be randomly assigned to a group. Once a case study is assigned to your group, no change request will be entertained. You are also n allowed to exchange the case study assigned to you with another group.

Each case study contains **THREE** parts, which will serve as instructions to be included in the project deliverables (refer to Section V).

a) **Section 1.0: Database System Requirements**
   - Section 1.0 contains system requirements describing the database system to be implemented. From the requirements, you will derive the project modules for **System Planning** and design the entity relationship model for **System Design**.

b) **Section 2.0: Additional Requirements**
   - Section 2.0 list additional requirements to expand your entity relationship model for **System Implementation** and **System Demo**.

c) **Section 3.0: SQL Query**
   - Section 3.0 requires you to write a SQL query to generate a cross-module report. Write the specific SQL (DML) statement based on the instructions given to be included in **System Implementation** and **System Demo**.

V. Project Implementation

There are 4 main deliverables in the group project.

Deliverable 1: System Planning Report

Module division and assignment to each group member.

Study the business requirements provided in Section 1.0 of the case study carefully. The requirements describe the full database system for your group to design and implement. Based on the business requirements, each group must identify **four modules**. Think of a module being a collection of interrelated entities for a particular functionality of the database system. Each member in a group must be responsible for at least one module in the project. For each module, the following requirements must be fulfilled:

- Each member must demonstrate and develop a database design which involves **multiple-tables** or **entities** with proper **attributes** and connected by appropriate **relationships** (1:M, 1:1 or M:N).
- Each module must have **at least four unique entities**.
- Each member must produce a **workable sub-system with multiple forms** which are able to perform common database functions such as **adding**, **viewing**, **updating** and **deleting** records.
- Each member must be able to produce relevant **user reports (tabular or chart)** from the database.

All the modules must be integrated as a complete system. Each group has to demonstrate a database application which consists of at least **four (4)** modules at the end of this semester.

Deliverable 2: System Design Report

Data modeling (business rules and ER diagram).

Based on the business requirements in Section 1.0, each member should write proper business rules and draw the partial Entity Relationship Diagram (ERD) for the module assigned to him or her. There may be business rules that may involve two modules. For a cross-module business rule, discuss among the members to determine which module should cover the business rule. Make sure the same business rule is not repeated multiple times in different modules.

All the partial ERDs from each module should be integrated into one complete ERD at the end of the report.

Deliverable 3: System Implementation Report

Implementation of database, forms and user reports.

The project must be developed using the **Oracle Database 11g Express Edition**. Oracle is used to develop the backend database while the front-end application (forms) must be able to connect to your Oracle database. **Oracle APEX** will be used to develop the frontend application. Each group should set up a free Oracle APEX Cloud account (can also choose to use the group leader's Oracle APEX Cloud account to implement and integrate the complete system). Link to Oracle APEX Cloud: https://apex.oracle.com/en/.

The report will include an updated ERD that includes the requirements stated in Section 2.0 of the case study. In addition to reporting the database implementation details, you are expected to include the SQL query and an Oracle APEX user-generated report based on the instructions provided in Section 3.0 of the case study.

Deliverable 4: System Demo

Presentation of the database application.

Every group is expected to conduct a system demo of your group's database application implemented using Oracle APEX at the end of the semester. Each group must present a fully integrated (all modules integrated) database system in ONE single Oracle APEX Cloud account (e.g., can choose the group leader's account). Each member must participate in the system demo and explain the module(s) done by him/her. Details of the system demo (e.g., procedures, mode, time, etc.) will be made available towards the end of the semester.

I. Deliverables and Important Dates

The project deliverables and important dates are as follows (see Table 1).

Deliverables	**Due Dates**	**Report Submission**
Group Formation and Project Title Suggestion	WEEK 02 (03 Nov 2021, Wednesday)	ELEARN + Padlet
System Planning	WEEK 04 (21 Nov 2021, Sunday)	Soft copy
System Design	WEEK 07 (12 Dec 2021, Sunday)	Soft copy
System Implementation	WEEK 15 (06 Feb 2022, Sunday)	Soft copy
System Demo	WEEK 15	

Table 1: Project deliverables and important dates.

Submission procedure: All reports should be prepared in a Word document format and submitted to the appropriate submission dropboxes on ELEARN. All submissions must be completed by **11.59 P.M.** of the mentioned due dates listed in Table 1.

VI. Documentation Format and Guidelines

This section explains the documentation format and guidelines on how to prepare the System Planning Report, System Design Report and System Implementation Report.

Report Format:

All reports must comply with the following format:

- Font: Times New Roman.
- Font size: 11.
- 1.5 lines spacing.
- Content should be aligned to both left and right margins (i.e., justify).
- Page size: A4 (8.27" x 11.69").
- All pages must be properly numbered.
- For all reports (System Planning Report, System Design Report and System Implementation Report), a cover page must be included. Report with no cover page will not be graded. Refer to Section IX for the sample cover page.

System Planning Report:

The **System Planning Report** should contain the following:

i. A cover page containing the case study number and title.
ii. A list of team members (name, matric number, USM email, role, major/minor)
iii. A list of modules derived from Section 1 of the case study. For each module, a brief description of the module scope is expected (in one or two sentences).
iv. Task division. It is compulsory to highlight who is taking care of which module.

System Design Report:

The **System Design Report** should focus on the conceptual design of the database. The conceptual design is performed without considering a specific DBMS and hardware (DBMS and hardware independent). The System Design Report ***must not exceed 10 pages*** and should contain the following:

i. Cover page.
ii. Business rules **(*20 marks*)**. For each identified module stated in your System Planning report, a set of business rules must be clearly stated and explained. Business rules are derived from the requirements.
iii. Entity relationship modeling **(*70 marks*)**. For the entity relationship diagram (ERD), please clearly state which notation (e.g., Chen notation, Crow's Foot notation or UML notation) is adapted in your report and be consistent in all ERDs. Make sure to include all relationship names, relationship participation, connectivity, cardinality, etc. Can be divided into two parts: partial ERD for each module and full ERD (combining all 4 modules).
iv. Overall documentation ***(10 marks)***.

Final Report:

The final report ***must not exceed 30 pages*** and should contain the following:

i. Cover page.
ii. Advanced ERD (***10 marks***). The updated business rules and ERD with appropriate amendment and corrections. These amendment and corrections must be highlighted. The final ERD must also include the requirements from Section 2.0 of the case study.
iii. Normalization (***20 marks***). Specify the highest normal form all modules should achieve and justify why the normal form is selected. Explain if each table/relation from your ERD has achieved the selected normal form. If a table is not in the desired normal form, show the normalization steps. Do not need to start from 1NF if the tables from your ERD are already in higher normal form.
iv. Data dictionary (***10 marks***).
v. Database implementation (***40 marks***).
    - DDL, PL/SQL: SQL commands to create and implement the data structure and objects. Also include the use of triggers and stored procedures for data manipulations (if any).
    - DML, User report design: Write the SQL statement based on Section 3 of the case study and design an Oracle APEX user-generated report using the SQL statement (include a clear screenshot of the report design in run mode).
vi. Reflection (***10 marks***). Write a reflection based on your project experience. Can include project problems and pitfalls, how you overcome the problems and what did you learn from the database project.
vii. Overall documentation ***(10 marks)***.

VII. Project Evaluation Rubrics

The project contributes 20% of your overall grade. The marks distribution of the project is as follows:

- System Design: 5%.
- System Implementation: 7%.
- System Demo: 8%.

The System Design, System Implementation and System Demo will be evaluated according to their corresponding grading rubrics which are made available on the eLearn@USM. Both individual (based on individual module) and group grading components will be taken into account.

Peer evaluation will be carried out at the end of the semester in which each member will be asked to evaluate every other member in the group. This is to make sure every member contributes towards the project and to identify sleeping or non-contributing members who will be penalized. Details about the peer evaluation will be disclosed during the semester.

VIII. Contacts

Your group will be assigned to one of the following mentors. Do not hesitate to approach your mentor if your group encounters any problem throughout the entire project implementation period. Note that the role of the mentor is to help clarify the requirements or address specific questions you may come across about the case study.

- Do NOT ask your mentor for the solution.
- Do NOT ask your mentor to pre-check your report before submission.

Mentor Name	**Email**
Dr. Jasy Liew Suet Yan	jasyliew@usm.my
Mr. Heng Yew Ken	hengyewken96@student.usm.my
Mr. Lim Ying Hao	yinghaoly@student.usm.my

IX. Appendix - Sample Cover Page

SCHOOL OF COMPUTER SCIENCES

UNIVERSITI SAINS MALAYSIA

CMT221/CMM222: Database Organization and Design

Semester 1, Academic Session: 2021/2022

System Planning / System Design / System Implementation

Group Number

Case Study Number: Project Title

Name	Matric No.	USM Email	Module	Role	Core/Minor
Ahmad Zurkanain	100000	abc@student.usm.my	ABC	Leader	Core
Mutu A/P Selvan	100001	def@student.usm.my	DEF	Member	Core
Maximus Kitingan	100002	ghi@student.usm.my	GHI	Member	Minor
Lim Min Suan	100003	jkl@student.usm.my	JKL	Member	Minor

Date of Submission

20 September 2021