University of Exeter

Faculty of Environment, Science and Economy

ECM2419 - Database Theory and Design

Course Work

Release Date: Tuesday 31st October 2023
Submission Deadline: 12:00 noon Thursday 30th November 2023

This course work weights 40% of the overall module assessment. This is an **individual assessment** and you are reminded of the University's Regulations on Collaboration and Plagiarism. You must avoid plagiarism, collusion and any academic misconduct behaviours. Further details about Academic Honesty and Plagiarism can be found at https://ele.exeter.ac.uk/course/view.php?id=1957

1. OBJECTIVES

This aim of the coursework is to carry out the following steps involved in a database system development:

1. Conceptual model design
   (i) Draw an Entity-Relationship Diagram (ERD) using **UML notation**
   (ii) Documentation of the ERD

2. Logical model design
   (i) Transform the ER model into a relational model
   (ii) Specify relational constraints (primary keys, foreign keys)

3. Database implementation
   (i) Implement the physical database system using **MySQL**, which includes creating tables in the database with SQL, and populating the database with data.
   (ii) Test and validate your database design by writing queries in SQL.

Note that these are design tasks which may require students to resolve ambiguities, fill in relevant missing details, and carefully interpret the specification. Students are expected to do this autonomously and explicitly explain and justify all their design decisions.

2. PROBLEM STATEMENT

In this assignment, you are required to conduct an analysis and design a database for an online ticket booking system. This online ticket booking website offers services that enable customers to book tickets online for events such as circuses, concerts, shows, etc.

The system will store details of each event. Some events have only one ticket price, while others offer a range of prices (e.g., adult ticket price and child ticket price). Each event has a fixed number of tickets that can be sold for each ticket type. Seats are not numbered.

When a customer decides to purchase tickets, they will enter their basic information, select the chosen event, and specify the quantity of each type of ticket required. The system will save the booking with a unique reference code.

Each event may offer several voucher codes, each with a unique code and a discount. If a customer enters a valid code, their payment will be automatically discounted. Customers can choose to have tickets sent by email or pick them up at the venue just before the performance.

A booking is considered successful only if the customer has paid in full using a credit card or debit card. The website will display the total amount to be charged, and the customer will need to enter their card type (e.g., Visa, Mastercard or Amex), the card number, the security code, and the card's expiry date. For simplicity, you may assume that the customer is the cardholder. Card details will be stored in the booking system’s database for future reference.

Customers have the option to cancel their booking and receive a full refund before the event takes place. Once the event has started, the booking for that event cannot be cancelled.

3. WHAT YOU SHOULD SUBMIT

You should submit a compressed zip file (.zip) via the coursework submit portal on the module ELE2 page (https://ele.exeter.ac.uk/course/view.php?id=10429) by **12:00 noon on Thursday 30th November 2023.** The zipped file should contain the following files (**4 files in total**) as specified in the table below, and your report **must not exceed 5 pages (5 sides of A4)**.

File name	Description
ticket_design.pdf	Write a report detailing the design of the Ticket Booking Database system, which comprises two main parts: 1) Conceptual model design: Create an Entity Relationship Diagram (ERD) using UML notation. This ERD should encompass all the necessary entities, including their attributes, relationships and multiplicity constraints, to fully address the database specifications. When needed, you should make reasonable assumptions to fill in relevant missing details. The report should provide a comprehensive description and rationale for your selection of entities, relationships, entity attributes, primary keys, and the cardinality of relationships in your design. Please note that the use of UML notation is required; any other notations will result in a 10-mark penalty. 2) Logical model design: Transform the previously created ERD into a relational model.
ticket_init.sql	Write an SQL file that creates all the relations in the database, and populate it with sufficient data to demonstrate your solutions to the queries below. You may make up any data that you see fit for this purpose. Note that the minimal requirement for your generated data is to ensure that at least one meaningful row is output, or non-zero amount for any query in '**ticket_query.sql**' and successful updates in the '**ticket_update.sql**'.
ticket_query.sql	Write an SQL file that implements the following queries. Note that the data you generated in the previous stage must guarantee at least one meaningful row is output for each of the following queries: 1) There are two types of tickets: Adult tickets for those who are over 16 years old and Child tickets for those aged 5 to 15 years old, available for the Exeter Food Festival 2023. List all relevant information about this festival, including the venue, the starting and end time, the total number of each type of tickets. 2) Find all the events in Exeter starting from 1 July, 2023 to 10 July, 2023. List the event title, starting time and end time, and description. 3) There are three types of tickets (Gold, Silver, Bronze) for the Exmouth Music Festival 2023. List available ticket amount for the Bronze ticket type, together with its price. 4) List all the customer's names who have booked Gold tickets for the Exmouth Music Festival 2023, together with the number of Gold tickets booked for each customer. 5) List all event names and the number of tickets that have been sold for each event so far, ordered by the number of sold tickets in descending order.

	6) List all the relevant information by offering a booking ID, such as the customer's name, booking time, event title, delivery options, ticket types and the number of tickets for each type, the total payment and so on. 7) Find which event has the maximum income so far. List its event title and its total income.
ticket_update.sql	Write an SQL file that implements the following queries: 1) Increase the amount of Adult tickets for the Exeter Food Festival by 100. 2) Ian Cooper would like to book 2 adults and 1 child tickets for the Exeter Food Festival today, using voucher code 'FOOD10' to get 10% off discount. He used his credit card to pay for it, and has chosen the tickets sent by email. 3) Joe Smiths had a booking for one event which has not taken place. Today he would like to cancel this booking by offering the booking ID. 4) Add one more voucher code for the Exmouth Music Festival 2023, the code is 'SUMMER20', with 20% off discount.

4. MARKING SCHEME

4.1 Report

Task	Key Aspects to be Assessed	Mark Allocated
Conceptual model design	Marks will be allocated for identifying and appropriately naming all the entities, relationships and attributes that ensure that the resulting database design will comply fully with the specifications and any other requirements from your reasonable assumptions. Marks will be allocated for indicating the cardinality of each entity in each relationship, for identifying and labelling the primary keys of all the entities, and for appropriate use of enhanced constructs (e.g., generalisation/specialisation).	30
Documentation of ERD	Marks will be allocated for a systematic description and clear justification of all elements of your design, stating explicitly and justifying any assumptions made. This includes clear justification of your use of entities, relationships and attributes; justification of the choice of the primary keys of all the entities as well as the cardinality of each entity in a relationship; justification of enhanced construct. Writing and presentation will also be assessed.	10
Logical model design	Marks will be allocated for the correct relational model that matches the ERD designed in the previous stage.	15
Penalty of overlength submissions (-10 marks) Penalty of drawing ERD without using UML notation (-10 marks)		

4.2 Coding

Task Description	Key Aspects to be Assessed	Mark Allocated
ticket_init.sql	The code can be run successfully in MySQL. The created tables and views match the content in the relational model. The data are sufficient and adequate for demonstrating all the queries and updates. All the input data are consistent among tables.	8
ticket_query.sql	The code can produce correct outputs for all seven queries as mentioned in Section 3. Each query is worth 3 marks.	21
ticket_update.sql	The code can produce correct outputs for all four queries as mentioned in Section 3. Each query is worth 4 marks.	16