AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)

Dept. of Computer Science
Faculty of Science and Technology

CSC 2210: OBJECT ORIENTED PROGRAMMING 2

Summer 2024-2025

Section: M

Group No: 06

Project Report On

Car Rental Management System

Supervised By

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CO2: Display and verify the mean of a real-life Project using the concepts of C# Graphical User Interface based environment with database integration to depict a desktop-based application.

Assessment Criteria	Not Attended/ Incorrect (0)	Inadequate (1-2)	Average (3)	Good (4)	Excellent (5)
Evaluation Criteria	**Evaluation Definition**				**Total =**
Requirement fulfillment	Properly demonstrate a real-life scenario-based project with proper functional requirement identification for the Object-Oriented Programming project development activities.				
Validation	Ensuring the ability of students' proper demonstration on validation forms in their system in terms of dealing with the data.				
Verification	Identifying if the students can verify the system data along with proper functional requirements in terms of data flow.				

Table of Contents

1. INTRODUCTION

The Car Rental Management System is designed to simplify and automate the process of managing car rental businesses. It provides a structured workflow for three different users – Admin, Staff and Accountant to smoothly perform their specific functionalities. The admin manages cars, staffs and accountants, views dashboards and rentals, expense and customers details. Staff handles customer management, rentals, and maintenance while Accountants manage invoices, payments, and expenses. This project helps to enhance efficiency, reduce manual workload and provide simple record management for a car rental business.

2. FEATURE LIST

The system supports three users – Admin, Staff and Accountant.

2.1 ADMIN

The admin user controls the entire system and is responsible for overall management. The main features available to the admin include:

- **Manage Cars**: Add, update, delete, search and clear car records.
- **Manage Staffs**: Add, update, delete, search and clear staff records.
- **Manage Accountants**: Add, update, delete, search and clear accountant records.
- **Dashboard**: View system summary such as total cars, available cars, total staffs and total accountants.
- **Rentals**: View rental records.
- **Expense**: View expense records.
- **Customers**: View customer details.
- **Logout**: Securely exit the system.

2.2 STAFF

The Staff manages operations concerning customers. Features available include:

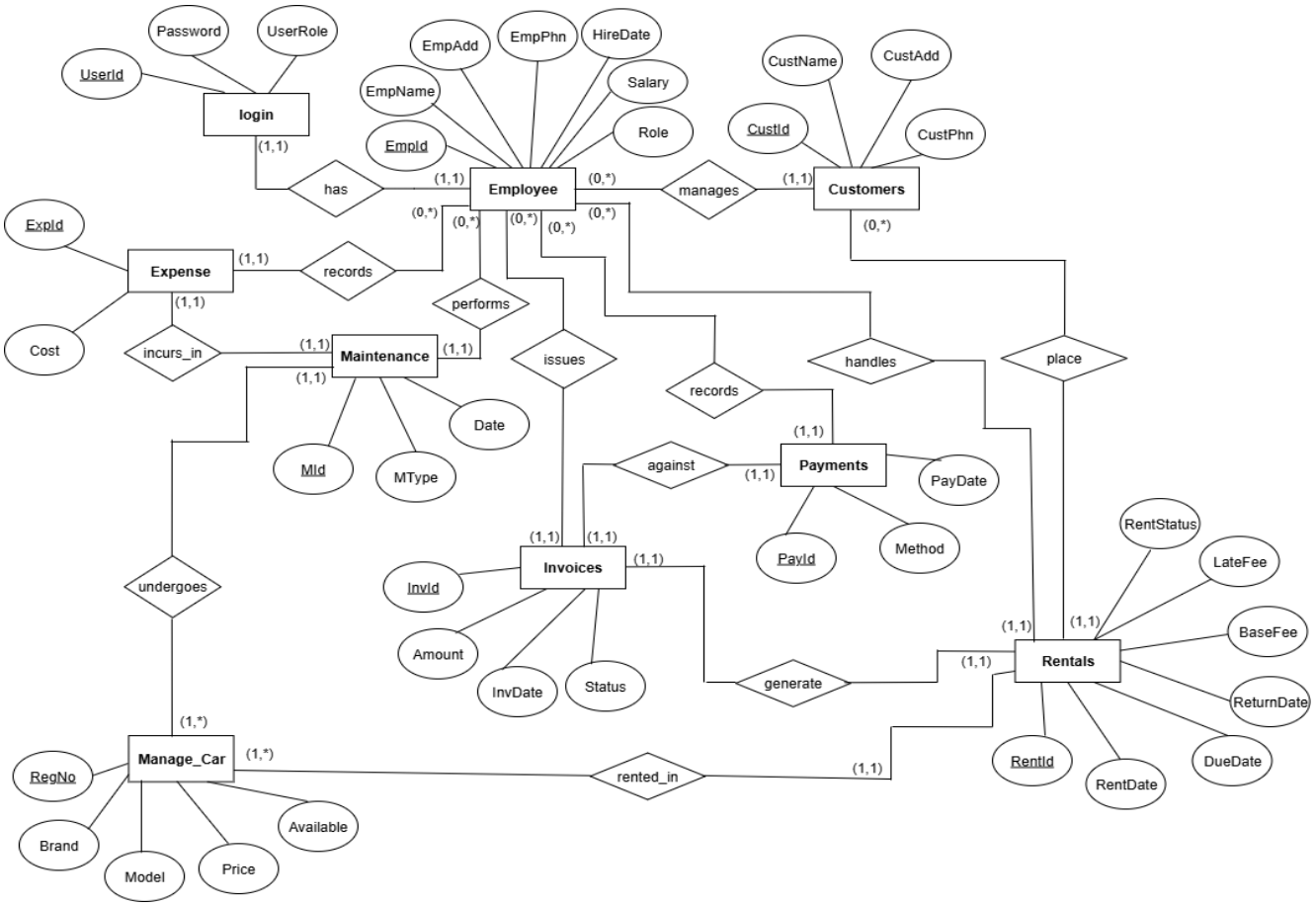
- **Manage Customers**: Add, update, delete, search and clear customer records.
- **Manage Rentals**: Add, update, delete, search and clear rental records.
- **Manage Maintenance**: Add, update, search and clear maintenance records.
- **Logout**: Securely exit the system.

2.3 ACCOUNTANT

The accountant manages the financial aspects of the rental system. Features available include:

- **Manage Invoices**: Add, update, delete, search and clear invoice records.
- **Manage Payments**: Add, delete, search and clear payment records.
- **Manage Expenses**: Add, update, delete, search and clear expense records.
- **Logout**: Securely exit the system.

3. ER DIAGRAM



NORMALIZATION

Employee has login
Relation: One to One
UNF: EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role, UserId, Password, UserRole
1NF: Already in 1NF form.
2NF: 1) EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role
2) UserId, Password, UserRole, EmpId (Fk)

Employee manages Customers
Relation: One to Many
UNF: EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role, CustId, CustName, CustAdd, CustPhn
1NF: Already in 1NF form.
2NF: 1) EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role
2) CustId, CustName, CustAdd, CustPhn, EmpId (Fk)

Employee records Expense
Relation: One to Many
UNF: EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role, ExpId, Date, Cost
1NF: Already in 1NF form.

2NF: 1) EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role
2) ExpId, Date, Cost, EmpId (Fk)

Expense incurs_in Maintenance
Relation: One to One
UNF: ExpId, Cost, MId, MType, Date
1NF: Already in 1NF form.
2NF: 1) ExpId, MId (Fk), Cost
2) MId, MType, Date

Manage_Car undergoes Maintenance
Relation: One to Many
UNF: RegNo, Brand, Model, Price, Available, MId, MType, Date
1NF: Already in 1NF form.
2NF: 1) RegNo, Brand, Model, Price, Available
2) MId, RegNo (Fk), MType, Date

Employee performs Maintenance
Relation: One to Many
UNF: EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role, MId, MType, Date
1NF: Already in 1NF form.
2NF: 1) EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role
2) MId, MType, Date, EmpId (Fk)

Employee issues Invoices
Relation: One to Many
UNF: EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role, InvId, Amount, InvDate, Status
1NF: Already in 1NF form.
2NF: 1) EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role
2) InvId, Amount, InvDate, Status, EmpId (Fk)

Invoices against Payments
Relation: One to One
UNF: InvId, Amount, InvDate, Status, PayId, Method, PayDate
1NF: Already in 1NF form.
2NF: 1) InvId, Amount, InvDate, Status
2) PayId, InvId (Fk), Method, PayDate

Employee records Payments
Relation: One to Many
UNF: EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role, PayId, Method, PayDate
1NF: Already in 1NF form.
2NF: 1) EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role
2) PayId, Method, PayDate, EmpId (Fk)

Employee handles Rentals
Relation: One to Many
UNF: EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role, RentId, RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus

1NF: Already in 1NF form.
2NF: 1) EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role
2) RentId, RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus, EmpId (Fk)

Customers place Rentals
Relation: One to Many
UNF: CustId, CustName, CustAdd, CustPhn, RentId, RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus
1NF: Already in 1NF form.
2NF: 1) CustId, CustName, CustAdd, CustPhn
2) RentId, CustId (Fk), RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus

Rentals generate Invoices
Relation: One to One
UNF: RentId, RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus, InvId, Amount, InvDate, Status
1NF: Already in 1NF form.
2NF: 1) RentId, RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus
2) InvId, RentId (Fk), Amount, InvDate, Status

Manage_Car rented_in Rentals
Relation: One to Many
UNF: RegNo, Brand, Model, Price, Available, RentId, RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus
1NF: Already in 1NF form.
2NF: 1) RegNo, Brand, Model, Price, Available
2) RentId, RegNo (Fk), RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus

FINALIZATION

login → UserId, Password, UserRole, EmpId (Fk)

Employee → EmpId, EmpName, EmpAdd, EmpPhn, HireDate, Salary, Role

Customers → CustId, CustName, CustAdd, CustPhn, EmpId (Fk)

Manage_Car → RegNo, Brand, Model, Price, Available

Rentals → RentId, CustId (Fk), RegNo (Fk), RentDate, DueDate, ReturnDate, BaseFee, LateFee, RentStatus, EmpId (Fk)

Maintenance → MId, RegNo (Fk), MType, Date, EmpId (Fk)

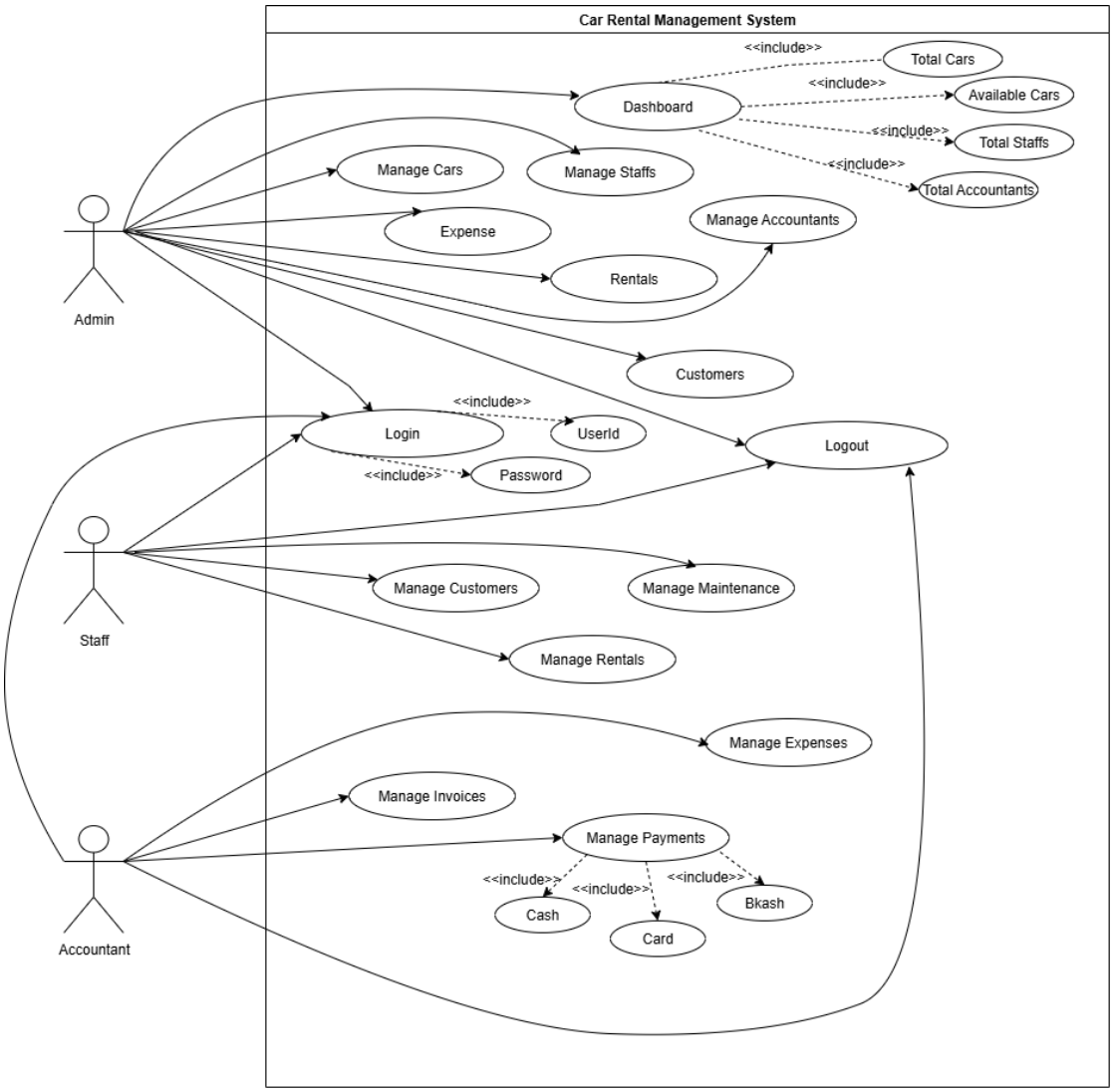
Invoices → InvId, RentId (Fk), Amount, InvDate, Status, EmpId (Fk)

Payments → PayId, InvId (Fk), Method, PayDate, EmpId (Fk)

Expense → ExpId, MId (Fk), Cost, EmpId (Fk)

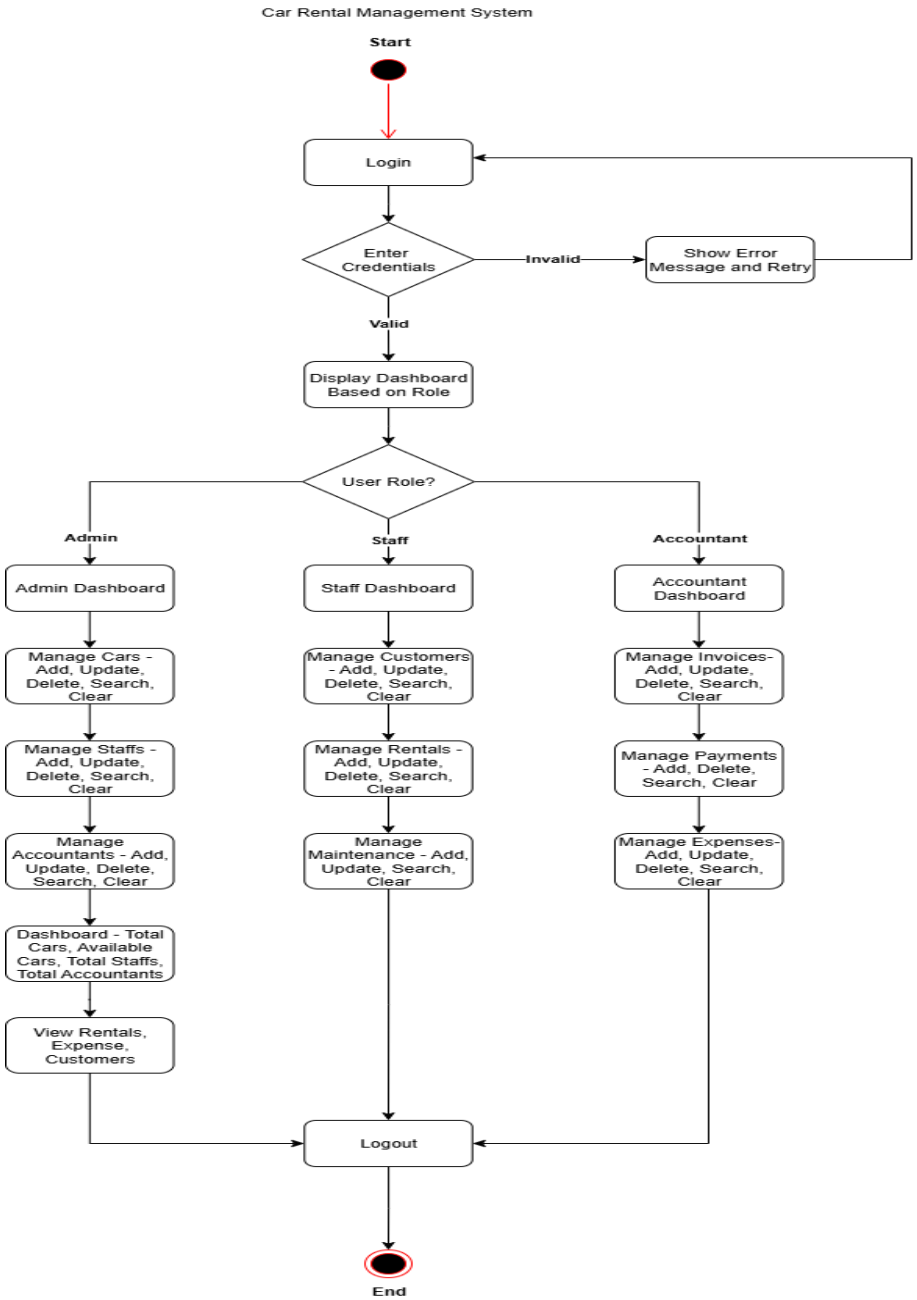
4. UML DIAGRAM

4.1 Use Case Diagram



The Use Case Diagram for the Car Rental Management System illustrates the system's interactions with its three primary actors Admin, Staff and Accountant. The three actors are required to log in initially using a user id and password prior to performing any system activities and can log out after completing their work. Admin has full access to the system with the power to manage cars, staffs and accountants and to view details of customers, rentals and expenses. Admin also has access to a Dashboard that displays summarized information which includes total cars, available cars, total staffs and total accountants. The Staff manages operations concerning customers such as managing customers, rentals and maintenance. The Accountant handles the money aspect of the system such as invoices, payments and expenses. The Payment use case includes various payment methods – cash, card and bkash using <<include>> relationships. Overall, this diagram represents an administrative-oriented system where all users interact with the system according to their respective roles to efficiently manage the car rental business activities.

4.2 Activity Diagram.



The Activity Diagram for the Car Rental Management System illustrates the overall workflow of the system starting from user login to system logout. The users enter their login details which are verified by the system based on their role (Admin/Staff/Accountant) and then they are directed to their respective dashboards. The Admin can perform detailed management of cars, staffs and accountants through CRUD operations such as add, update, delete, search and clear. Admin can also view system statistics like total cars, available cars, total staffs and total accountants as well as rentals, expense and customers data. The Staff performs core operational activities such as managing customers, rentals and maintenance ensuring smooth functioning through CRUD operations. The Accountant oversees financial activities like processing invoices, payments, and expenses, and performs similar core operations to maintain accurate records. After completion of work, all users can logout marking the end of the process.

5. CONCLUSION

The Car Rental Management System is a complete solution to manage the operations of a car rental business in a well structured, role based system administration. The system ensures efficient management of cars, customers, rentals, maintenance, invoices, payments and expenses through defining the functionalities for Admin, Staff and Accountant roles. The usage of CRUD operations on each module enhances data accuracy, consistency and easy management whereas role based access control ensures security and proper workflow. Overall, this system increases working efficiency, decreases manual work and provides a reliable system to smoothly operate car rental services and thus improves productivity and customer satisfaction.