NORTHERN UNIVERSITY BANGLADESH

Department of Computer Science and Engineering

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Abstract

University Management System (UMS) is a comprehensive digital solution designed to streamline and centralize the core administrative and academic functions of a university. The key objective of this project is to automate essential processes such as student enrollment, faculty management, course scheduling, examinations, fee payment, and library operations, thereby enhancing efficiency, transparency, and accessibility across departments. The system is developed using a relational database management approach, where structured tables handle various modules including students, faculty, courses, departments, and finance. The methodology involves the design of an Entity-Relationship (ER) model, normalization of database tables, and implementation using SQL for backend management.

A web-based interface or desktop interface is used to interact with the system, developed using programming technologies such as HTML/CSS, PHP, Java, or Python (depending on implementation). The design ensures role-based access control to maintain data security and integrity. The expected outcomes of this project include reduced administrative workload, real-time access to academic and financial records, accurate reporting and analytics, and improved coordination between stakeholders. Overall, the University Management System contributes to a more efficient, paperless, and organized university environment aligned with modern digital education standards.

Acknowledgement

First of all I would like to thank the Almighty ALLAH. Today we are successfully in completing our work with such case because He give us the ability, chance a cooperating supervisor.

A journey becomes easier when it is travelled together. Interdependence is certainly more valuable and faithful than independence. This project is the result of more than 3 months of work hair by we have been accompanied and supported by many people. It is an exceptional opportunity for us to utter our earnest sense of appreciation, sincere approval heartful indebtedness and profounds regards to the following person that have contributed radically in the complications of the work.

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Finally, we sincerely acknowledge all the resources and references that contributed directly or indirectly to the successful completion of this project report.

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Introduction

The University Database Management System is a comprehensive software solution designed to modernize and streamline administrative operations within higher education institutions. This project features an intuitive user interface that provides access to various university management functions including student information, course registration, faculty management, library services, and transportation systems.

The front-end application has been developed with a focus on usability and efficiency, offering different interfaces tailored for administrators, faculty, staff, and students. The interface enables users to perform essential academic and administrative tasks through a centralized platform, with carefully designed navigation and data presentation formats.

While the current implementation includes a fully functional user interface with form validation, responsive design, and interactive elements, the backend database integration remains as future work. The UI demonstrates the complete workflow of university operations, showcasing how the system would function when connected to the underlying database system.

This project represents the initial phase of development, establishing a strong foundation for a complete university management solution that can significantly improve operational efficiency, data accessibility, and user experience in educational institutions.

Motivation Behind the Project

Managing multiple institutional services manually is prone to errors, delays, and data inconsistencies. This project aims to replace those fragmented systems with a centralized database solution that allows for secure, accurate, and efficient handling of academic, library, and transport operations. It also serves as a scalable model for institutions aiming to transition to digital systems.

Objectives and Scope

To design normalized relational schemas for university, library, and transport modules.

To define entity relationships using appropriate keys (PKs and FKs) to ensure data integrity.

To facilitate real-time access, modification, and tracking of academic records, book inventory, and transport activities.

To allow modular expansion for future needs such as hostel management, cafeteria, or placement systems.

System Design and Implementation

List of Tables with Purpose:

Table Name	Purpose
Students	Stores student personal, academic, and admission details.
Faculty	Contains faculty details like designation, department, and status.
Departments	Manages academic departments and their heads.
Courses	Stores course details including credits, semester, and department.
Enrollments	Tracks which students are enrolled in which courses.
Grades	Records students' grades and CGPA.
Attendance	Maintains students' attendance status per class.
Exams	Holds exam schedules and types for each course.
Timetable	Schedules class timings, faculty assignments, and rooms.
Staff	Non-teaching staff information (admin, clerical, etc.).
Finance	Manages students' fee details, payments, and dues.
Administration	Stores admin login credentials and roles.
Books	Stores details of books (title, author, ISBN, copies).
Authors	Contains information about book authors.
Issued Books	Tracks which books are issued to which students.
BookReservations	Manages book reservation requests by students.
Library Staff	Holds details of library employees.
Transport	Stores bus details (driver, capacity, status).
Routes	Manages bus routes with start/end points and timings.
Transport Registration	Tracks students registered for transport services.

Table:1

ER-Diagram:

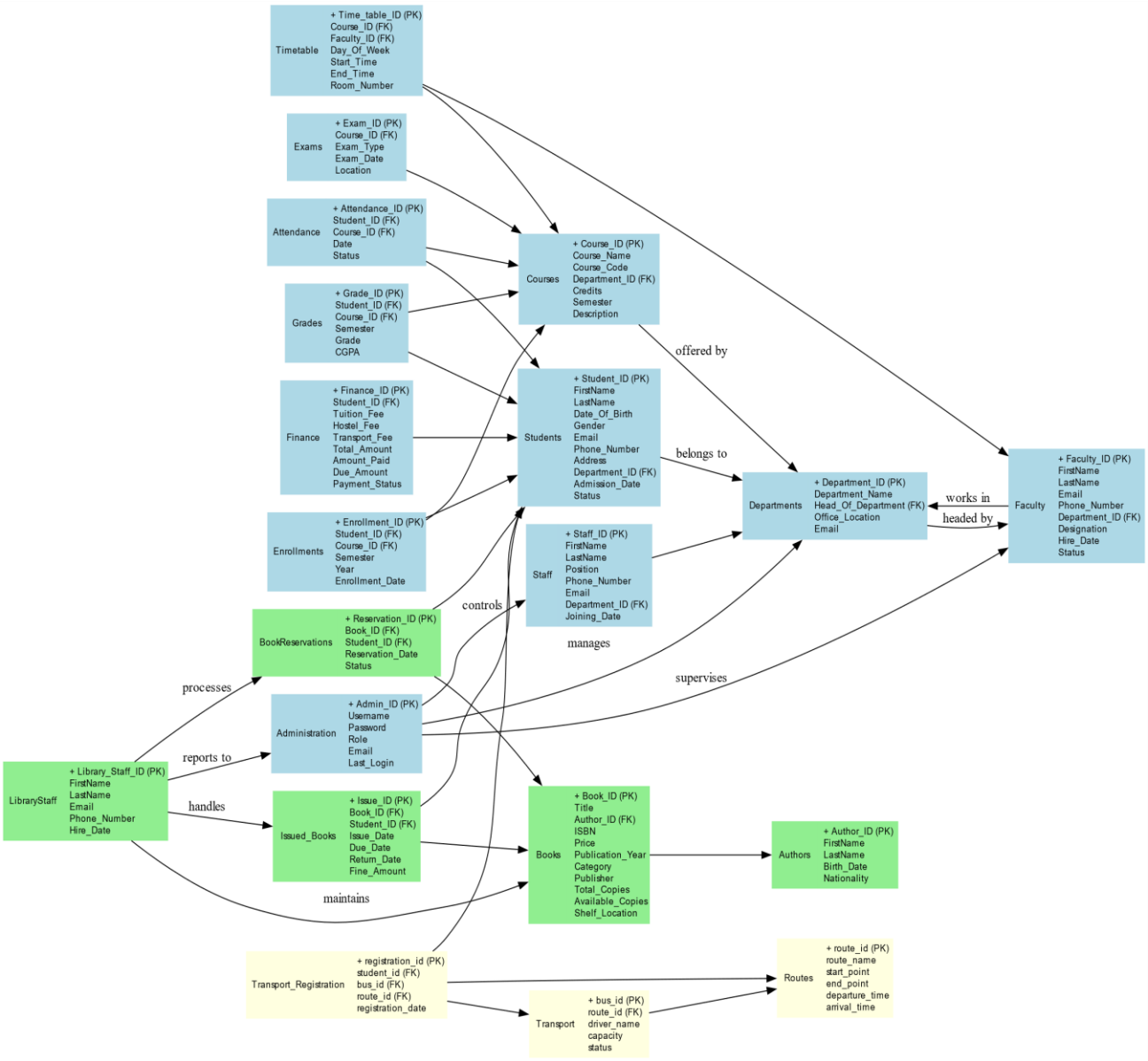

Figure-1

User Interface:

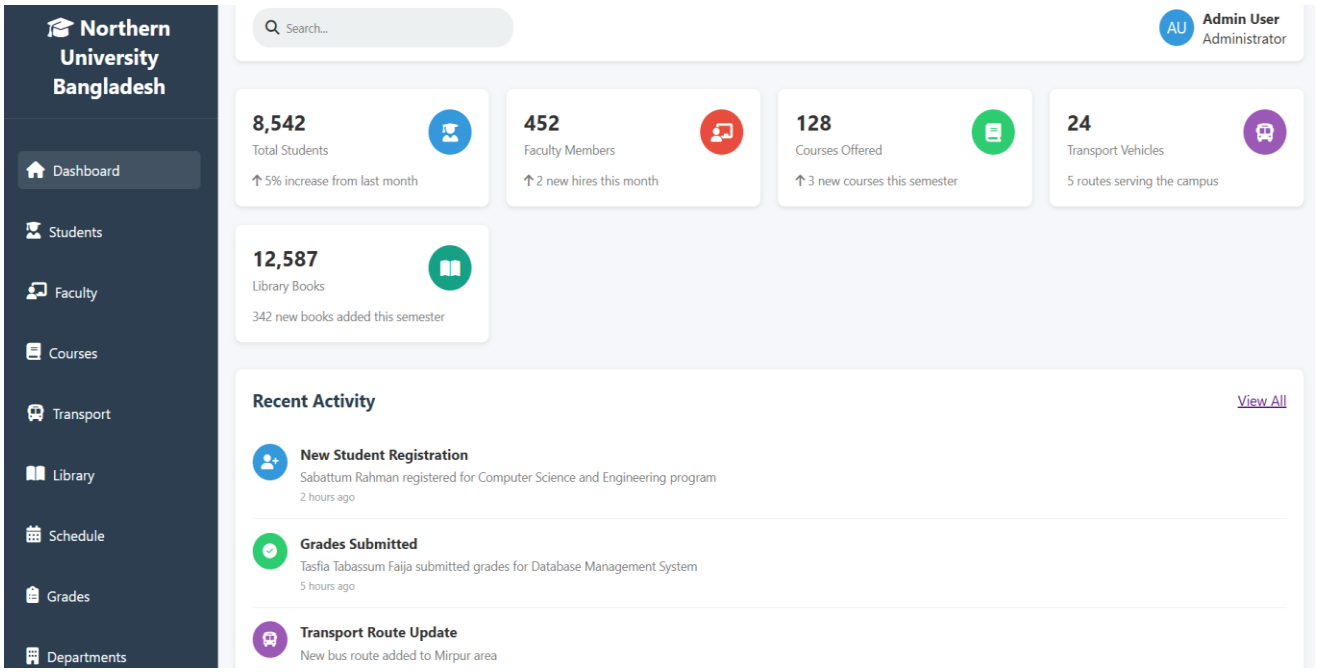

Figure-2

Physical Schema (Table Structure with Attributes)

1.UNIVERSITY MANAGEMENT

1.1 Students

- Student_ID (PK): Integer
- FirstName: VARCHAR (60)
- LastName: VARCHAR (60)
- Date_Of_Birth: DATE
- Gender: VARCHAR (10)
- Email: VARCHAR (100)
- Phone_Number: VARCHAR (20)
- Address: VARCHAR (200)
- Department_ID (FK): Integer
- Admission_Date: DATE
- Status: VARCHAR (20) (Active, Graduated, Suspended, etc.)

1.2 Faculty

- Faculty_ID (PK): Integer
- FirstName: VARCHAR (60)
- LastName: VARCHAR (60)
- Email: VARCHAR (100)
- Phone_Number: VARCHAR (20)

- Department_ID (FK): Integer
- Designation: VARCHAR (60)
- Hire_Date: DATE
- Status: VARCHAR (20) (Active, Retired, On Leave, etc.)

1.3 Departments

- Department_ID (PK): Integer
- Department_Name: VARCHAR (100)
- Head_Of_Department (FK): Integer (FacultyID)
- Office_Location: VARCHAR (100)
- Email: VARCHAR (100)

1.4 Courses

- Course_ID (PK): Integer
- Course_Name: VARCHAR (100)
- Course_Code: VARCHAR (20)
- Department_ID (FK): Integer
- Credits: INTEGER
- Semester: VARCHAR (10)
- Description: TEXT

1.6 Enrollments

- Enrollment_ID (PK): Integer
- Student_ID (FK): Integer
- Course_ID (FK): Integer
- Semester: VARCHAR (10)
- Year: INTEGER
- Enrollment_Date: DATE

1.6 Grades

- Grade_ID (PK): Integer
- Student_ID (FK): Integer
- Course_ID (FK): Integer
- Semester: VARCHAR (10)
- Grade: VARCHAR (2)
- CGPA: DECIMAL (3,2)

1.7 Attendance

- Attendance_ID (PK): Integer
- Student_ID (FK): Integer
- Course_ID (FK): Integer
- Date: DATE
- Status: VARCHAR (10) (Present/Absent/Late)

1.8 Exams

- Exam_ID (PK): Integer
- Course_ID (FK): Integer
- Exam_Type: VARCHAR (10) (Mid, Final, Quiz
- Exam_Date: DATE

- Location: VARCHAR (100)

1.9 Timetable

- Time_table_ID (PK): Integer
- Course_ID (FK): Integer
- Faculty_ID (FK): Integer
- Day_Of_Week: VARCHAR (10)
- Start_Time: TIME
- End_Time: TIME
- Room_Number: VARCHAR (20)

1.10 Staff

- Staff_ID (PK): Integer
- FirstName: VARCHAR (60)
- LastName: VARCHAR (60)
- Position: VARCHAR (60)
- Phone_Number: VARCHAR (20)
- Email: VARCHAR (100)
- Department_ID (FK): Integer
- Joining_Date: DATE

1.11 Finance

- Finance_ID (PK): Integer
- Student_ID (FK): Integer
- Tuition_Fee: DECIMAL (10,2)
- Hostel_Fee: DECIMAL (10,2)
- Transport_Fee: DECIMAL (10,2)
- Total_Amount: DECIMAL (10,2)
- Amount_Paid: DECIMAL (10,2)
- Due_Amount: DECIMAL (10,2)
- Payment_Status: VARCHAR (20) (Paid/Unpaid/Partial)

1.12 Administration

- Admin_ID (PK): Integer
- Username: VARCHAR (60)
- Password: VARCHAR (100)
- Role: VARCHAR (60)
- Email: VARCHAR (100)
- Last_Login: DATETIME

2. LIBRARY MANAGEMENT

2.1 Books

- Book_ID (PK): Integer
- Title: VARCHAR (100)
- Author_ID (FK): Integer
- ISBN: VARCHAR (20)
- Price: DECIMAL (10,2)
- Publication_Year: INTEGER

- Category: VARCHAR (60)
- Publisher: VARCHAR (100)
- Total_Copies: INTEGER
- Available_Copies: INTEGER
- Shelf_Location: VARCHAR (60)

2.2 Authors

- Author_ID (PK): Integer
- FirstName: VARCHAR (60)
- LastName: VARCHAR (60)
- Birth_Date: DATE
- Nationality: VARCHAR (60)

2.3 Issued_Books

- Issue_ID (PK): Integer
- Book_ID (FK): Integer
- Student_ID (FK): Integer
- Issue_Date: DATE
- Due_Date: DATE
- Return_Date: DATE
- Fine_Amount: DECIMAL (10,2)

2.4 BookReservations

- Reservation_ID (PK): Integer
- Book_ID (FK): Integer
- Student_ID (FK): Integer
- Reservation_Date: DATE
- Status: VARCHAR (20) (Pending, Completed, Cancelled)

2.5 LibraryStaff

- Library_Staff_ID (PK): Integer
- FirstName: VARCHAR (60)
- LastName: VARCHAR (60)
- Email: VARCHAR (100)
- Phone_Number: VARCHAR (20)
- Hire_Date: DATE

3. TRANSPORT MANAGEMENT

3.1Transport

- bus_id (PK): Integer
- route_id (FK): Integer
- driver_name: VARCHAR (20)
- capacity: Integer
- status: VARCHAR (20)

3.2 Routes

- route_id (PK): Integer
- route_name: VARCHAR (20)

- start_point: VARCHAR (20)
- end_point: VARCHAR (20)
- departure_time:TIME
- arrival_time:TIME

3.3 Transport_Registration

- registration_id (PK): Integer
- student_id (FK): Integer
- bus_id (FK): Integer
- route_id (FK): Integer
- registration_date:DATE

Methodology / Implementation

Technologies Used:

- Oracle
- HTML/CSS (frontend)
- PHP/Python (backend, optional)

Implementation Steps:

- Requirement Analysis
- Database Design**:** Tables for books, buses, students.
- Schema Creation in oracle
- Query and Data Handling**:** CRUD operations, joins, constraints.
- Interface (Optional): For admin and student interaction

Innovation & Uniqueness

The project's uniqueness lies in its deep integration of three standalone systems—Central Database, Library, and Transport—into a single, intelligent ecosystem. This moves beyond simple record-keeping to create a connected, efficient university environment.

Key Uniqueness:

- **Unified Student Profile:** A single dashboard for students and staff shows academic status, library activity (loans/fines), and transport details (pass validity), eliminating the need to juggle separate systems.
- **Smart Automation via PL/SQL**: Cross Module Rules: Automated processes enforce business rules (e.g., "block semester registration if library fines are unpaid" or "deactivate bus pass if enrollment is inactive").
- **Data-Driven Triggers:** System auto-calculates library fines and sends renewal reminders, ensuring data integrity and timeliness without manual effort.
- **Actionable Analytics:** The system generates practical reports (e.g., popular books by department, bus route occupancy) to aid in decision-making for resource allocation and cost savings.

- **Role-Aware User Interface (UI):** The UI is not generic. It provides tailored dashboards: Students see their schedule, borrowed books, and next bus time in one place. Administrators get a consolidated view of a student's entire university footprint.

In a nutshell, this project transforms separate administrative functions into a cohesive, intelligent, and user-centric platform that enhances efficiency, decision-making, and the overall user experience for the entire university.

Results & Discussion

Results:

The project delivered:

- A unified Oracle database schema integrating academic, library, and transport data.
- A robust PL/SQL backend automating key processes (fine calculation, eligibility checks).
- A functional, role-based UI for students and administrators.
- Successful validation of core integrated features, like blocking library access for students with unpaid fines or inactive enrollment.

Discussion:

The results confirm the system's effectiveness in breaking down data silos. The deep integration and business logic in PL/SQL ensure automatic enforcement of university policies, significantly boosting efficiency and data integrity. The UI, though not yet connected, provides a validated blueprint for user interaction. This design is not only practical but also scalable, allowing for the easy addition of new modules in the future. The project successfully serves as a powerful proof of concept for a centralized university management platform.

Applications and Future Scope

Applications:

- For Universities & Colleges: Serves as a centralized, operational system to manage student data, library resources, and transport logistics, replacing disconnected spreadsheets or legacy software.
- For Students: Provides a single portal to access academic records, check book availability, borrow/return items, and manage bus pass subscriptions, significantly improving convenience.
- For Administrators: Automates critical tasks like fine collection, student eligibility verification, and report generation, freeing up staff time and reducing human error.
- For Management: Offers data-driven insights (e.g., popular book genres, bus route efficiency) through integrated reporting to support better resource allocation and strategic planning.

Future Scope:

- UI and Database Integration: The immediate next step is to fully connect the completed user interface (UI) with the robust PL/SQL backend. This will transform the prototype into a fully functional, interactive application, allowing users to perform all operations seamlessly through the graphical interface.

- Mobile Application Development: Following the core system's completion, a mobile app can be developed to provide students with on-the-go access to library services, real-time bus tracking via GPS, and important notifications.
- Expansion with New Modules: The integrated database is designed for scalability. Future work can add new modules such as Hostel Management, Canteen Payments, or Placement Cell Management into the same unified system.
- Advanced Features: The foundation allows for the incorporation of advanced technologies like an AI-powered book recommendation system and data analytics dashboards for administrators to generate deeper insights into resource usage.
- Cloud Deployment: Migrating the entire system to a cloud platform will enhance accessibility, data security, and scalability, allowing for remote management and easier updates.

Conclusion

In conclusion, this University Management System was developed to simplify and modernize the way academic and administrative activities are handled in educational institutions. By bringing all essential functions—like student records, attendance, course management, and fee tracking—into one centralized platform, the system improves efficiency, reduces errors, and saves time for both staff and students. Throughout the development process, we focused on making it user-friendly, secure, and scalable. The successful implementation and testing of the system show that it can make a real difference in how universities operate. With further development, it has the potential to become a complete solution for digital campus management.

References

1.Laudon, K.C., & Laudon, J.P. (2020). Management Information Systems: Managing the Digital Firm (16th Edition). Pearson Education.
2.Elamir, E.A. & Adwan, O. (2020). “University Management Information Systems: A Modern Approach to Academic Administration.” International Journal of Computer Applications, 176(18), 16–20.
3.W3Schools. (n.d.). MySQL Tutorial. Retrieved from: https://www.w3schools.com/mysql/