**Project Overview**

The **Library Management System** is a comprehensive database-driven solution designed to streamline and enhance the operations of a public library. The primary objective of the system is to manage the library's collection of books, borrowers, and transactions efficiently. It will help library staff oversee book inventory, manage borrower information, and track loan transactions while improving the overall user experience for both library members and staff.

**Key Features:**

**Book Inventory Management**: Tracks each book in the library, including details such as ISBN, title, author, genre, publication year, and availability status. The system allows for easy addition, update, or removal of books by library staff.

**Borrower Information Management:** Maintains records of all library members, including personal details and borrowing privileges. Each member will have a unique ID and can borrow up to five books at a time.

**Loan Transactions:** Manages the lending and returning of books, including enforcing loan periods (14 days with one optional renewal) and tracking overdue items.

**Reservations and Holds:** Allows members to place holds on books currently checked out, and renew books if no hold exists.

**Fines and Overdue Notifications:** Automatically tracks late returns and applies fines as per library policy, while sending notifications to members for overdue books.

**Reports and Analytics:** Provides library staff with real-time data and reports on member activity, overdue books, borrowing trends, and book availability.

**Project Structure:**

The project will be completed in five key phases:

**Database Design:**

Analyze the business requirements and create an Entity-Relationship Diagram (ERD) to model the system's structure.

Entities include books, members, loans, and reservations, with appropriate relationships between them.

**Normalization:**

Normalize the database schema to ensure it is in 3NF (Third Normal Form), minimizing redundancy and ensuring data integrity.

**Database Creation:**

Implement the database schema using SQL, defining tables, primary keys, foreign keys, and constraints.

Insert sample data to simulate library operations.

**SQL Queries:**

Write SQL queries to retrieve meaningful information from the database, such as finding overdue books, checking available books by genre, and generating reports on borrowing activities.

**Database Management and Operations:**

Manage operations like updating book availability, adding/removing members, and handling loan and reservation transactions efficiently through SQL scripts.

**Technologies and Tools:**

**Database Management System:** MySQL

**SQL**: For database creation, querying, and management

**Entity-Relationship Diagram (ERD):** To visualize the database structure and relationships

**Conclusion:**

This Library Management System project is designed to enhance the operations of a public library by efficiently managing book inventory, member information, and loan transactions. The project will provide a robust database structure and SQL-based management system to improve day-to-day operations, enhance user experience, and offer insights through meaningful reports.