Introduction:
The Library Management System (LMS) is designed to automate operations for a small library, enabling efficient tracking of loanable items (books, digital media, magazines), managing memberships, enforcing borrowing rules, and generating analytical reports. The system aims to reduce manual effort, minimize errors, and enhance user experience for both library staff and patrons.

Glossary:

1. LMS - Library Management System
2. MySQL - Open source Database Management System
3. SSN - Social Security Number
4. ISBN - International Standard Book Number
5. ISSN - International Standard Serial Number
6. DOB - Date of Birth
7. TinyCat - existing small-scale library catalog service; capacity benchmark.
8. EECS - Electrical Engineering and Computer Science

Stakeholders:

1. Staff: Manage checkouts, returns, and client accounts.
2. Patrons: Search catalog, reserve items, view loans.
3. Admins: Maintain database security and roles.
4. Board: Review strategic reports.

Functional Requirements:

1. Core Operations
   · Track item availability (books, digital media, magazines).
   · Check membership status and standing of clients
   · Enforce membership-specific borrowing limits (e.g., seniors: 10 items).
   · Enforce borrowing limits based on account standing (overdue items)
   · Auto-calculate late fees and send notifications.
   · Support different views based on type of user (e.g. Library staff, clients)
   · Reserve items only if marked "on loan".
   · Handle custom queries.
2. Data Population
   · Preload: Handle a minimum of 20 books, 20 digital media, 20 magazines, 50 records for clients with varied loans and fees.

· Able to handle more than the minimum amount of records.

3. Reporting

· Generate reports from variable timeframes.

· Generate notifications for important data e.g. upcoming due dates, reserved item availability.

· Standard Reports: Overdue items, fee summaries, borrowing (genre, author) trends, average borrowing time.

· Advanced Reports:

· *Collection Analysis*: Genre distribution, average publication year.

· *Member Engagement*: Borrows per demographic (e.g., age, location).

Data Entities:

Entity	Key Attributes	Constraints
Book	ISBN (PK), Title, Author, Genre, Status, Transaction Count	ISBN unique; Status ∈ {Available, On Loan}
Digital Media	MediaID (PK), Title, Format, Status, Transaction Count	Format ∈ {eBook, Audiobook, DVD}
Magazine	ISSN (PK), Title, Issue No., Status, Transaction Count	Issue No. ≥ 1
Client	ClientID (PK), Membership Type, Status, Name, Address	Membership Type ∈ {Student, Senior, Regular}
Transaction	TransactionID (PK), Due Date, Return Date, Item Count	Due Date = Borrow Date + 14 days
Reports	ReportID (PK), Generation Date, Report Type	Report Type ∈ {Fine calculation, Book Availability, Client Activity, Trends, Revenue Summary, Monthly Summary }

Library Staff	StaffID (PK), Name, Age, SSN, DOB, Address

Non-Functional Requirements:

1. Performance
    - User concurrency
        - 50-100 concurrent users
    - Responsiveness
        - 2-5s queries
        - Quick UI
2. Availability/Reliability
    - Uptime
        - 99% uptime
    - Failsafe
        - Backup server
3. Scalability
    - Capacity
        - 10,000-20,000 items (per TinyCat)
    - Accommodate expansion
        - Items/Features
4. Security
    - Role-based access
        - Authorization
        - Admin/Staff/Member/Guest
    - Encryption
5. Backup/Recovery
    - Consistent backups
    - Cloud/local storage
    - Transaction history

Hardware/Software:

Software: MySQL, MariaDB, EECS servers

Hardware: Host computer, Client computer, 8GB RAM/50G ROM