Library Management System - Database Design

Slide 1: Title Slide

Title: Library Management System - Database Design
Subtitle: Data Modeling and Implementation
Presented by: [Your Name]

Slide 2: Introduction

Objective:

- To design a structured and efficient database for a Library Management System.
- Ensure smooth handling of books, users, and transactions.

Slide 3: Data Model - Identified Entities

Key Entities:

- Users (Students, Librarians, Admins)
- Books
- Transactions (Borrow/Return)
- Requests (Borrowing Requests)
- Reports
- Logs (Security/Transaction Logs)

Slide 4: Entity-Relationship (ER) Diagram

Relationships:

- Users borrow books via Transactions.
- Librarians approve/deny borrowing Requests.
- Admins generate Reports and manage Users.
- Logs track security events and transactions.

(Include a visual ER Diagram in this slide)

Slide 5: Database Schema - Users Table

users Table:

- user_id (Primary Key)
- name, email (Unique), role (Student/Librarian/Admin)
- password_hash (Stored securely)
- created_at (Timestamp)

Slide 6: Database Schema - Books Table

books Table:

- book_id (Primary Key)
- title, author, ISBN (Unique)
- publication_year
- status (Available/Borrowed)
- added_by (Foreign Key to users)

Slide 7: Database Schema - Transactions Table

transactions Table:

- transaction_id (Primary Key)
- user_id (Foreign Key to users)
- book_id (Foreign Key to books)
- borrow_date, due_date, return_date
- status (Approved/Denied/Returned)

Slide 8: Database Schema - Requests Table

requests Table:

- request_id (Primary Key)
- user_id (Foreign Key to users)
- book_id (Foreign Key to books)
- request_date (Timestamp)
- approval_status (Pending/Approved/Denied)

- approved_by (Foreign Key to users)

Slide 9: Database Schema - Reports & Logs

reports Table:

- report_id (Primary Key)
- generated_by (Foreign Key to users)
- type (Borrowing Stats/User Activity)
- content (Text)
- generated_at (Timestamp)

logs Table:

- log_id (Primary Key)
- type (Security/Transaction)
- description (Text)
- timestamp (Timestamp)

Slide 10: Indexing for Optimization

- **Indexes on:**
    - books(title, author) → Faster book searches.
    - users(email) → Quick login verification.
- Improves database performance and query efficiency.

Slide 11: Triggers for Automation

- **Trigger 1:** Update book status to 'Borrowed' when a transaction is approved.
- **Trigger 2:** Update book status to 'Available' when a book is returned.

(SQL examples can be provided if needed)

Slide 12: Business Rules & Constraints

- Referential integrity enforced using Foreign Keys.
- Restricted delete operations to avoid data loss.

- Default values for key attributes (e.g., book status = 'Available').

Slide 13: Physical Model & Implementation

- **DBMS Used:** MySQL
- Tables designed for normalization (3NF) to avoid redundancy.
- Ready for real-world implementation with indexing and triggers.

Slide 14: Summary

- Well-structured Library Management Database.
- Ensures efficient book tracking, user management, and borrowing transactions.
- Implements automation and optimization techniques.

Slide 15: Q&A

Any questions?
Thank you for your time!
