**Shelf Masters**

**Library Management System**

**Version 1.0**

**Revision History**

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| --- | --- | --- | --- |
| **Date** | **Version** | **Description** | **Author** |
| 15/Mar/25 | 1.0 | Initial Conceptual Modeling | Abhiroop Goel |
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**Table of Contents**

1. **Introduction 4** 
   * 1. Project Overview
     2. Scope
     3. Definitions, Acronyms, and Abbreviations
     4. References

**2. ER Modeling Components**

2.1.1 Entities Identification

2.1.2 Attribute Definition

2.1.3 Relationship Definition

**3. ER Model Diagram**

**Database Requirements Specifications**

# Introduction

## Project Overview The Library Management System (LMS) is designed to simplify the management of library resources, memberships, and transactions. The database will store information on books, magazines, digital media, members, borrowing activities, reservations, and fines. It will provide functionality for tracking borrowed items, calculating overdue fines, generating reports, and managing member and staff accounts. The system aims to improve the library’s operational efficiency by streamlining cataloging, borrowing, and transaction processes.

## Scope

The LMS will cover functionalities including catalog management for books, magazines, and digital media, membership management, borrowing and returning transactions, reservation handling, and fine calculation. It will not handle e-book lending, external vendor integration, or advanced recommendation systems. The system will focus primarily on library-specific management tasks such as tracking loans, calculating fines, and generating reports for library activities.

## Definitions, Acronyms, and Abbreviations

* LMS: Library Management System
* ISBN: International Standard Book Number, a unique identifier for books
* Fine: A monetary charge for overdue items
* Member: A user of the library who can borrow items
* Transaction: A borrowing or returning event involving an item
* Reservation: A request by a member to borrow a currently unavailable item
* Availability: The status of an item indicating whether it is available for borrowing

## References

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| --- | --- | --- | --- |
| **Title** | **Date** | **Source** | **Link** |
| EECS447: Project Part 3 : Conceptual Modeling | January 21st, 2025 | EECS 447  Lecture on Canvas | [Project Part #3 Conceptual Modeling](https://canvas.ku.edu/courses/152575/assignments/993414) |

# ER Modeling Components

**2.1 Entity Identification**

* + Books: Represents the collection of books in the library.
    - Attributes: ISBN, Title, Author, Year, Genre, Availability
  + Magazines: Represents the magazines available in the library.
    - Attributes: Title, Issue Number, Publication Date, Availability
  + Digital Media: Represents the digital media (e.g., DVDs, e-books) in the library.
    - Attributes: Title, Creator, Format, Availability
  + Members: Represents individuals who are registered to borrow items.
    - Attributes: ID, Name, Contact Info, Membership Type, Account Status
  + Borrowing Transactions: Represents the borrowing and returning of library items.
    - Attributes: Transaction ID, Member ID, Item ID, Borrow Date, Due Date, Return Date, Fine
  + Reservations: Represents items reserved by members.
    - Attributes: Reservation ID, Member ID, Item ID, Request Date, Status
  + Staff: Represents staff members who manage the library system.
    - Attributes: Staff ID, Name, Role, Contact Info
  + Fines: Represents the fines imposed on overdue items.
    - Attributes: Fine ID, Transaction ID, Amount, Fine Status

**2.2 Attribute Definition**

* **Books**: ISBN (Primary Key), Title (VARCHAR), Author (VARCHAR), Year (YEAR), Genre (VARCHAR), Availability (BOOLEAN)
* **Magazines**: Title (VARCHAR), Issue Number (INT), Publication Date (DATE), Availability (BOOLEAN)
* **Digital Media**: Title (VARCHAR), Creator (VARCHAR), Format (VARCHAR), Availability (BOOLEAN)
* **Members:** ID (Primary Key), Name (VARCHAR), Contact Info (VARCHAR), Membership Type (VARCHAR), Account Status (VARCHAR)
* **Borrowing Transactions**: Transaction ID (Primary Key), Member ID (Foreign Key), Item ID (Foreign Key), Borrow Date (DATE), Due Date (DATE), Return Date (DATE), Fine (DECIMAL)
* **Reservations**: Reservation ID (Primary Key), Member ID (Foreign Key), Item ID (Foreign Key), Request Date (DATE), Status (VARCHAR)
* **Staff**: Staff ID (Primary Key), Name (VARCHAR), Role (VARCHAR), Contact Info (VARCHAR)
* **Fines**: Fine ID (Primary Key), Transaction ID (Foreign Key), Amount (DECIMAL), Fine Status (VARCHAR)

**2.3 Relationship Definition**

* Books to Borrowing Transactions: One-to-many relationship (one book can have multiple borrowing transactions), tracking which books have been borrowed and by whom.
* Magazines to Borrowing Transactions: One-to-many relationship (one magazine can be borrowed multiple times).
* Digital Media to Borrowing Transactions: One-to-many relationship (one digital media item can be borrowed multiple times).
* Members to Borrowing Transactions: One-to-many relationship (one member can have multiple borrowing transactions).
* Members to Reservations: One-to-many relationship (one member can have multiple reservations).
* Staff to Borrowing Transactions: One-to-many relationship (staff can record multiple borrowing transactions).
* Staff to Members: One-to-many relationship (staff members can manage many members).
* Reservations to Borrowing Transactions: One-to-one relationship (when a reserved item is borrowed, it becomes a borrowing transaction).
* Borrowing Transactions to Fines: One-to-one relationship (each borrowing transaction can result in one fine).
* Members to Fines: One-to-many relationship (a member can accumulate multiple fines over time).

**3.0 ER Diagram**

**A diagram of a computer

Description automatically generated**