Library Management System

Project Overview

The Library Management System is a comprehensive solution designed to efficiently manage and organize books, customers, and library branches. It keeps track of book issuance, returns, and provides insights into library operations through a relational database schema.

Features

- **Book Management:** Track book details, including title, author, genre, and status.
- **Branch Management:** Manage multiple library branches with unique addresses.
- **Employee Management:** Record employee details and their respective branches.
- **Customer Management:** Manage customer information and their book issuance records.
- **Issue and Return Tracking:** Keep track of book issues and returns with dates.

Database Schema

Entities

- **Book:** Contains information about books in the library.
- **Branch:** Details of different library branches.
- **Employee:** Information about library employees.
- **Customer:** Records of library customers.
- **IssueRecord:** Tracks books issued to customers.
- **ReturnRecord:** Tracks books returned by customers.

Normalization

The database schema has been designed with normalization principles to reduce redundancy and improve data integrity. The tables are normalized to the **BCNF (Boyce-Codd Normal Form)**. Here is an overview of the normalization applied:

1. **Book Table:**
    - **Primary Key:** ISBN
    - **Foreign Key:** BranchID (References Branch Table)
2. **Branch Table:**
    - **Primary Key:** BranchID
3. **Employee Table:**
    - **Primary Key:** EmployeeID
    - **Foreign Key:** BranchID (References Branch Table)
4. **Customer Table:**

- **Primary Key:** CustomerID
- **Foreign Key:** BranchID (References Branch Table)

5. **IssueRecord Table:**
    - **Primary Key:** IssueID
    - **Foreign Key:** CustomerID (References Customer Table)
    - **Foreign Key:** BookISBN (References Book Table)
6. **ReturnRecord Table:**
    - **Primary Key:** ReturnID
    - **Foreign Key:** CustomerID (References Customer Table)
    - **Foreign Key:** BookISBN (References Book Table)

Normalization Details

- **1NF (First Normal Form):** All tables are in 1NF, with each column containing atomic (indivisible) values.
- **2NF (Second Normal Form):** All tables are in 2NF, with no partial dependency on any part of the primary key.
- **3NF (Third Normal Form):** All tables are in 3NF, ensuring that non-key attributes are not dependent on other non-key attributes.
- **BCNF (Boyce-Codd Normal Form):** The schema is in BCNF, where every determinant is a candidate key, addressing any anomalies that might not be covered by 3NF.