



LIBRARY MANAGEMENT SYSTEM - PROJECT REPORT

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• Project Overview

Sarasavi Library is a well-stocked library with 500+ books, offering both borrowing and reference services for registered members. The aim of this project is to develop a Library Management System (LMS) using C# .NET (Windows Forms) and MySQL, streamlining essential operations like Book Registration, Loan, Return, Reservation, Inquiry, and User Registration.

This system helps librarians efficiently manage books and users, reducing manual errors while improving the overall experience.

• Technologies Used

- **Programming Language:** C# 7.3
- **Framework:** .NET Framework 4.8
- **Database:** MySQL
- **IDE:** Visual Studio 2022
- **Libraries:** ReaLTaiizor for UI components, MySQL.Data for database connectivity

• Features Implemented

User Registration:

- Users can register with details such as name, gender, NIC, address, and user type (Member or Visitor).
- Only members can borrow books.

Book Management:

- Add book records.
- View available copies of books.

Loan Management:

- Loan books to users.
- Check if users have overdue books or have reached the maximum limit of borrowed books.
- Ensure only members can borrow books.

Return Management:

- Return borrowed books.
- Update the status of returned books and notify users of any reservations.

Reservation Management:

- Reserve books for users.
- Manage reservation details and notify users when reserved books are available.

• Database Design

The database consists of the following tables:

- **Users:** Stores user details including UserID, Name, Sex, NIC, Address, and UserType.
- **Books:** Stores book details including BookID, Title, Author, and ISBN.
- **Copies:** Stores details of book copies including CopyID, BookID, and Status (Borrowable, Reserved, etc.).
- **Loans:** Stores loan details including LoanID, UserID, CopyID, LoanDate, DueDate, and ReturnDate.
- **Reservations:** Stores reservation details including ReservationID, UserID, CopyID, ReservedDate, and IsFulfilled.

• Challenges and Solutions

Implementing Robust Error Handling and Logging

- **Challenge:** Handling errors gracefully and providing meaningful feedback to users is essential for a good user experience. Additionally, logging errors for debugging and monitoring purposes is crucial for maintaining the system.
- **Solution:** Implement try-catch blocks to handle exceptions and provide user-friendly error messages. Use a logging framework like NLog or log4net to log errors and other important events. Ensure that sensitive information is not exposed in error messages.

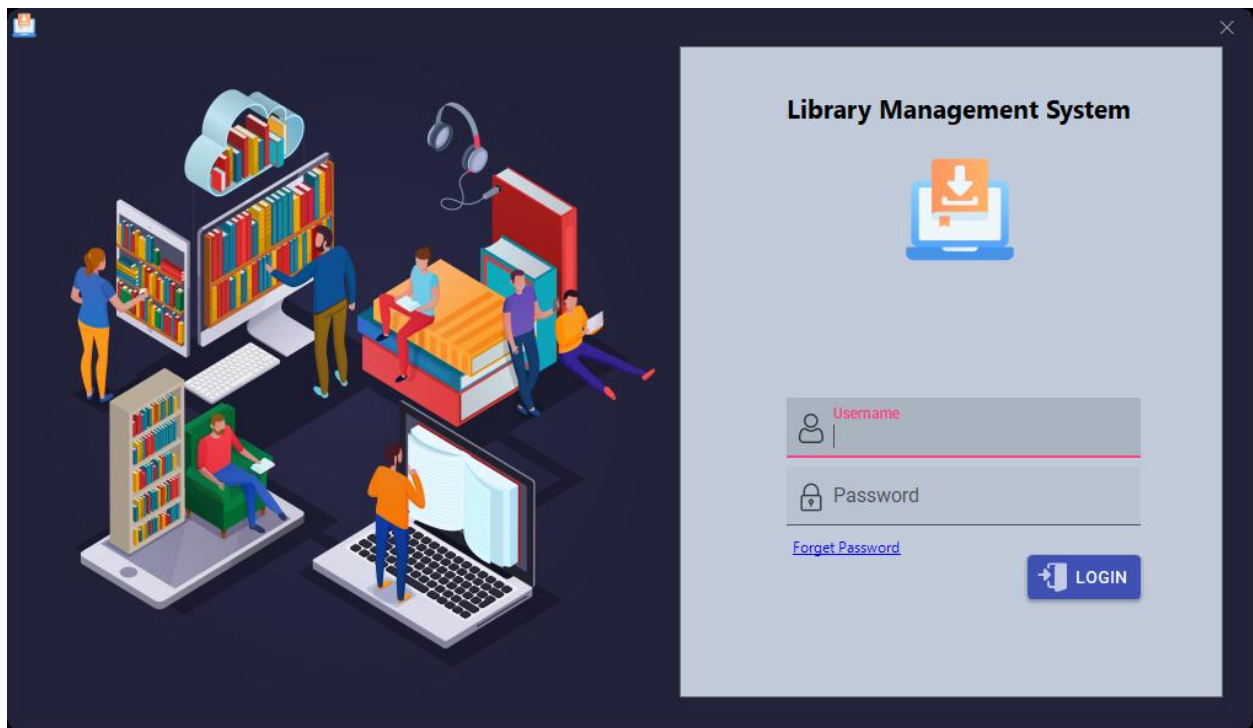
Database Connectivity

- **Challenge:** Managing database connections and ensuring data integrity.
- **Solution:** Utilized the MySQL.Data library for database operations and implemented proper exception handling to manage database connectivity issues.

• Screenshots and User Interface

Login Form

- **Purpose:** Authenticates users before granting access to the system.
- **Processes:** Validates user credentials against the database, displays error messages for invalid login attempts, and redirects authenticated users to the main dashboard.



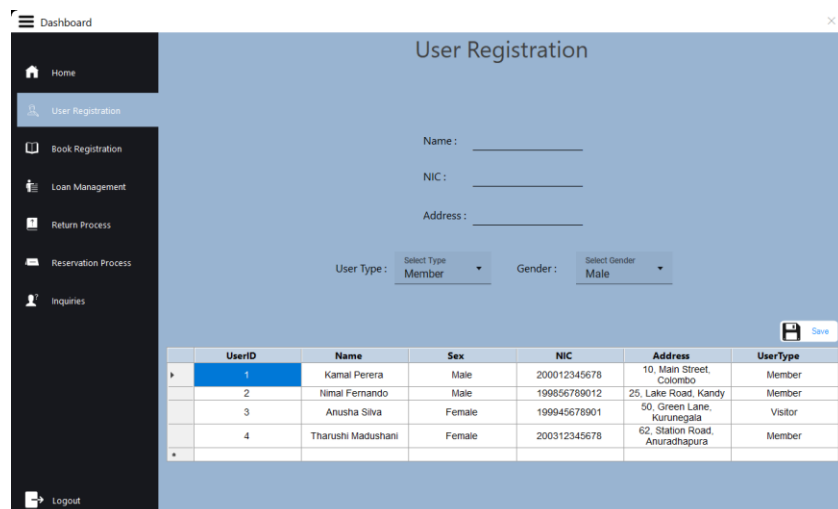
Dashboard

- **Navigation:** Provides buttons to navigate to different forms such as User Registration, Book Registration, Loan Management, Return Management, Reservation Management, and Inquiries.
- **Form Management:** Opens and closes child forms within the main panel, ensuring only one form is active at a time.
- **UI Enhancements:** Includes features like sidebar expansion, drag functionality, and color changes for active panels and buttons.
- **User Actions:** Allows users to log out and exit the application.



User Registration Form

- **Purpose:** Allows users to register by providing their details such as name, gender, NIC, address, and user type (Member or Visitor).
- **Processes:** Validates user input, saves user details to the database, and ensures that the user type is correctly assigned.



	UserID	Name	Sex	NIC	Address	UserType
▶	1	Kamal Perera	Male	200012345678	10, Main Street, Colombo	Member
	2	Nimal Fernando	Male	199856789012	25, Lake Road, Kandy	Member
	3	Anusha Silva	Female	199945678901	50, Green Lane, Kurunegala	Visitor
	4	Tharushi Madushani	Female	200312345678	62, Station Road, Anuradhapura	Member
✦						

Book Registration Form

- **Purpose:** Allows administrators to add new books to the library's collection.
- **Processes:** Collects book details such as title, author, and ISBN, and saves them to the database. Also manages the status of book copies.

The screenshot shows the 'Book Registration' form within a web application. The left sidebar contains navigation links: Home, User Registration, Book Registration (active), Loan Management, Return Process, Reservation Process, and Inquiries. The main content area has a title 'Book Registration' and input fields for Title, Author, ISBN, Publisher, and Total Copies (set to 1). Below these are dropdown menus for 'Classification' (set to A) and 'Copy Type' (set to Borrowable). A 'Save' button is located at the bottom right. A table at the bottom displays the registered books.

BookID	Classification	Title	Author	ISBN	Publisher	ClassificationCode
1	A	Introduction to Algorithms	Thomas H. Cormen	978-0262033848	The MIT Press	A0001
2	B	The Catcher in the Rye	J.D. Salinger	9780316769488	Little, Brown & Co.	B0001
3	C	To Kill a Mockingbird	Harper Lee	9780061120084	HarperCollins	C0001
4	A	1984	George Orwell	9780451524935	Penguin Books	A0002
5	A	The Great Gatsby	F. Scott Fitzgerald	9780743273565	Scribner	A0005
6	B	Harry Potter and the Sorcerer's Stone	J.K. Rowling	9780590353427	Scholastic Inc.	B0003

Loan Management Form

- **Purpose:** Manages the process of loaning books to users.
- **Processes:** Checks if the user is a member, verifies if the user has overdue books, ensures the user has not exceeded the maximum limit of borrowed books, and processes the book loan.

The screenshot shows the 'Loan Management' form within a web application. The left sidebar contains navigation links: Home, User Registration, Book Registration, Loan Management (active), Return Process, Reservation Process, and Inquiries. The main content area has a title 'Loan Management' and input fields for User ID and Book Name (set to Introduction to A). A 'Loan Book' button is located at the bottom right. A table at the bottom displays the loan records.

LoanID	UserID	CopyID	LoanDate	DueDate	ReturnDate
2	1	2	12/20/2024	1/3/2025 12:02 PM	2025-03-11
3	3	1	3/11/2025	3/25/2025 9:34 PM	2025-03-11

Return Process Form

- **Purpose:** Handles the return of borrowed books.
- **Processes:** Updates the return date in the database, checks for any reservations on the returned book, and notifies users if the book is reserved

Return Process

User ID:

Book Name:

[Return Book](#)

LoanID	UserID	CopyID	LoanDate	DueDate	ReturnDate
2	1	2	12/20/2024	1/3/2025 12:02 PM	2025-03-11
3	3	1	3/11/2025	3/25/2025 9:34 PM	2025-03-11

Reservation Process Form

- **Purpose:** Manages the reservation of books by users.
- **Processes:** Allows users to reserve books, updates reservation details in the database, and notifies users when reserved books become available.

Reservation

User ID:

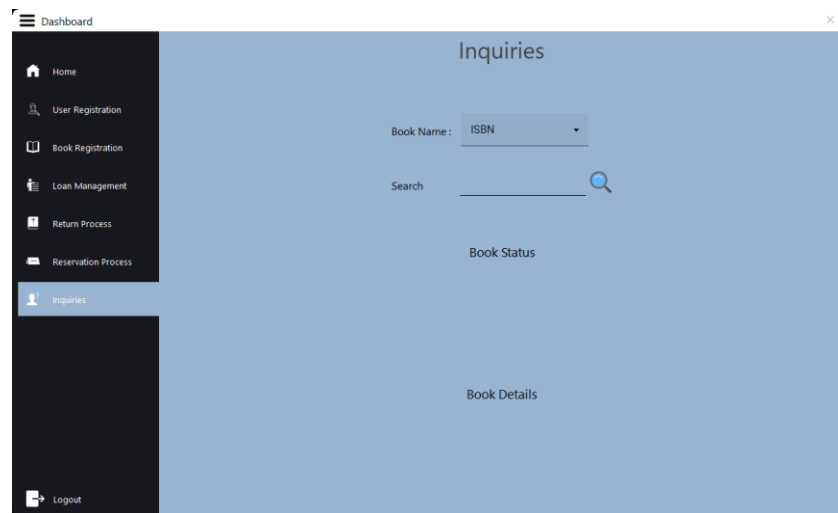
Book Name:

[Reserve](#)

ReservationID	CopyID	UserID	ReservedDate	IsFulfilled
1	1	1	12/20/2024 12:06 PM	0
2	16	3	3/11/2025 9:36 PM	0

Inquiries Form

- **Purpose:** Provides a way for users to inquire about available books and their details.
- **Processes:** Searches the database for books based on user input and displays the results, including availability status.



The screenshot shows a web application interface for a library management system. On the left is a dark sidebar with a 'Dashboard' menu icon at the top. Below it are several menu items: 'Home', 'User Registration', 'Book Registration', 'Loan Management', 'Return Process', 'Reservation Process', 'Inquiries' (which is highlighted with a blue bar), and 'Logout' at the bottom. The main content area has a light blue background and is titled 'Inquiries'. It contains a form with a 'Book Name' dropdown menu currently set to 'ISBN'. Below this is a 'Search' input field with a magnifying glass icon to its right. Further down, there are two labels: 'Book Status' and 'Book Details', each followed by a large, empty rectangular box, suggesting where search results would be displayed.

• Conclusion

The Library Management System provides a comprehensive solution for managing library operations, including user registration, book loans, returns, and reservations. By leveraging C# and .NET Framework, the system ensures a robust and efficient way to handle library resources.

Key functionalities like user type validation, overdue book checks, and automatic reservation notifications enhance the system's reliability and user experience. The implementation of a structured database with efficient queries ensures faster processing and accurate record-keeping.

Benefits of the System:

- Automates manual processes, reducing workload on librarians
- Improves book tracking & reduces errors
- Faster inquiry system to check book availability