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(Established under Karnataka Act No. 16 of 2013)

100 Feet Ring Road, BSK III Stage, Bengaluru-560 085

Department of Computer Science & Engineering

Digitization of College / School Library

“PESU Library Management Application”

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Abstract

A library management system is an effort to Digitize Library Operations in an Educational Institution; and this is a web application designed to manage all the functions of a library. It helps librarian to maintain the database of new books, books borrowed by members along with their due dates, maintain library records, track the number of books in the library, how many books are issued, or how many books have been returned or renewed or late fine charges, etc Librarian can even search for books, issue / reissue books, and manage all the data efficiently and orderly. The purpose of a library management system is to provide instant and accurate data wrt any type of book, borrowers, users and related and thus digitizing the Educational World



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Abbreviations:

Abbreviation	Explanation
TBD	To Be Done
LMS	Library Management System
NFR	Non-Functional Requirements (like Security, Performance)
UML	Unified Modelling Language
DB	Database
UI	User Interface



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Introduction

Objective: Effectively Access, Manage, Track, and Perform Daily Library Operations with Ease

Scope of the work and its importance: This is our first software development project – Thanks PESU very much for providing us this great opportunity; and this time, we have planned and developed a library management web application to help digitize the “Operations of Library” with all the basic as well as some innovative features for managing a library end to end. This includes a database of various books available in the library. It also lists various books issued to respective readers. The application keeps track of all the books readily available and also the books those have been issued to various lenders for the time period. Readers usually tend to forget the date to return their library books, so this application alerts them & even calculates fine depending on the expiry date. Thus, this digital library management system provides enhanced library functionalities for the modern world with alerts, reminders, notifications and related intelligence

Features of the Application: -

- **Librarian login:** The system will be under sole control of the Librarian. Librarian can add or remove books from the system and also maintains records of the book available and issued in the library. The Librarian can even update the books details if required.
- **Dashboard View:** Librarian will have a single place (a Dashboard or a Landing page) where he / she can manage various operations (like Manage Books, Borrowers, Users); and also, he / she will be notified about the books due (as a proactive Notification on Dashboard Page)
- **Manage Borrower:** Librarian as an Admin can manage Borrowers (Add, Delete, Update, View), and also manage issuance of the Books to Users
- **Manage Books:** Librarian as an Admin can manage Books (Add, Delete, Update, View), and also use Search features to manage the dependencies



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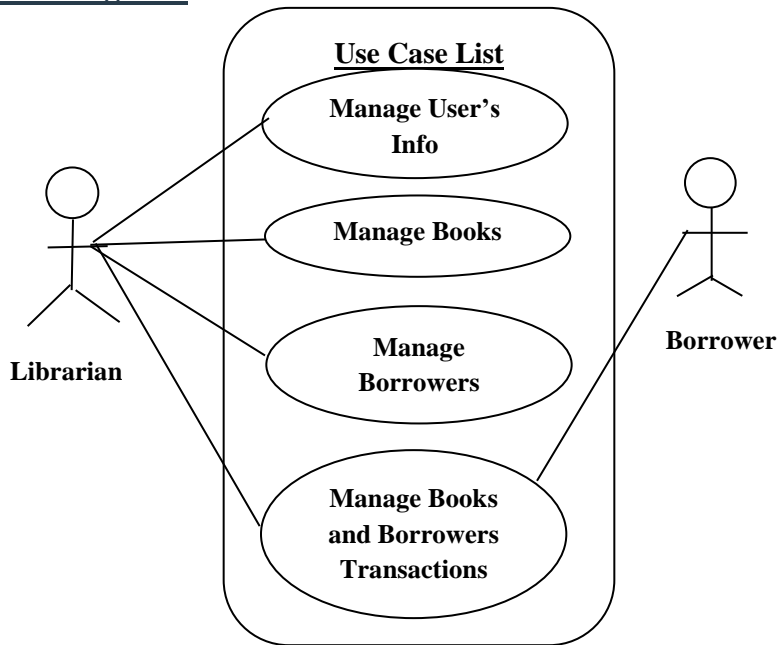
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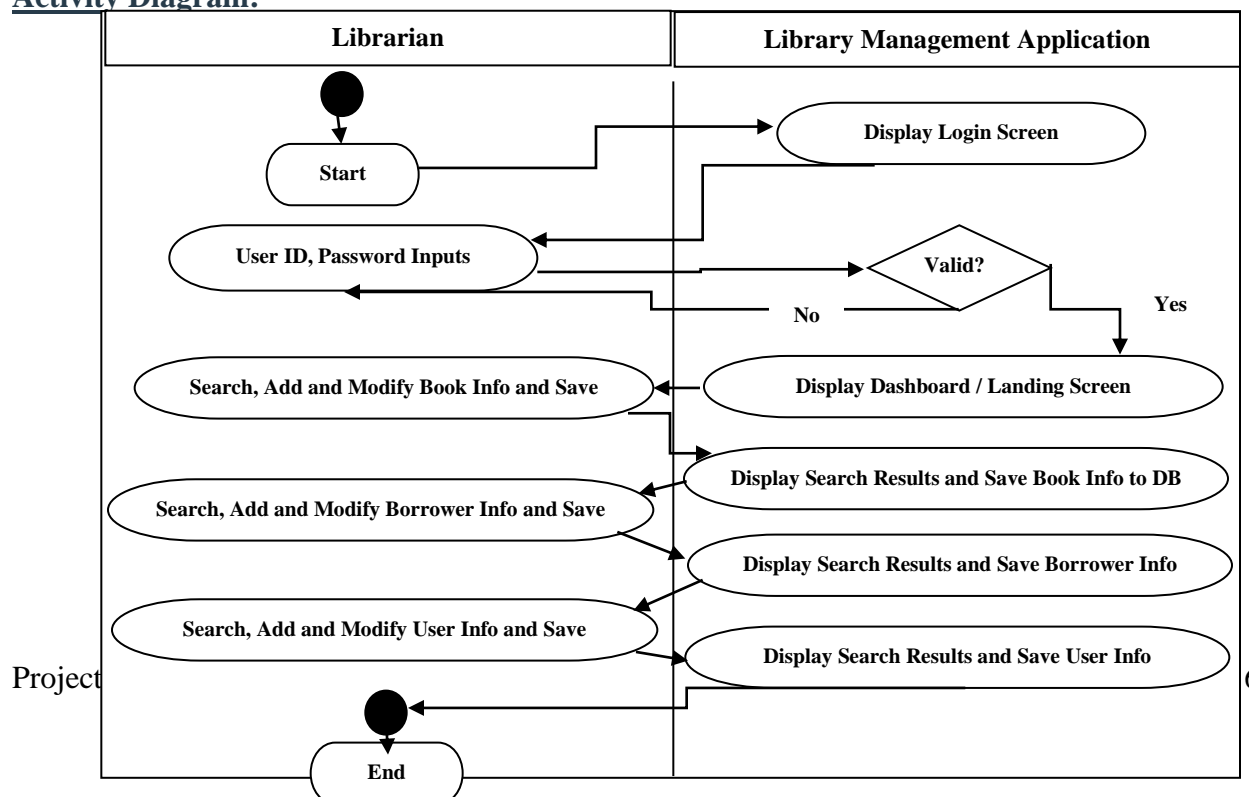
- **Tracking the Book / Borrower Movements:** The application can track the period for which the book has been issued to user and calculates fine if the book is not returned on time. application has intelligence to notify the Librarian on the pending borrowers with due date (Alert on Dashboard)
- **View date info:** The Librarian can search and view the date when he / she has issued the book as well as the expiry date; and can view fine to be paid that is calculated by the system
- **Calculate Fine:** The student can view the issue and expiry date for the book issued and can even calculate fine

Design: We have followed Unified Modeling Language (UML) Approach for Design; and have created various UML Diagrams (like Use Case Diagram, Activity Diagram, ER Diagram)

Use Case Diagram:



Activity Diagram:





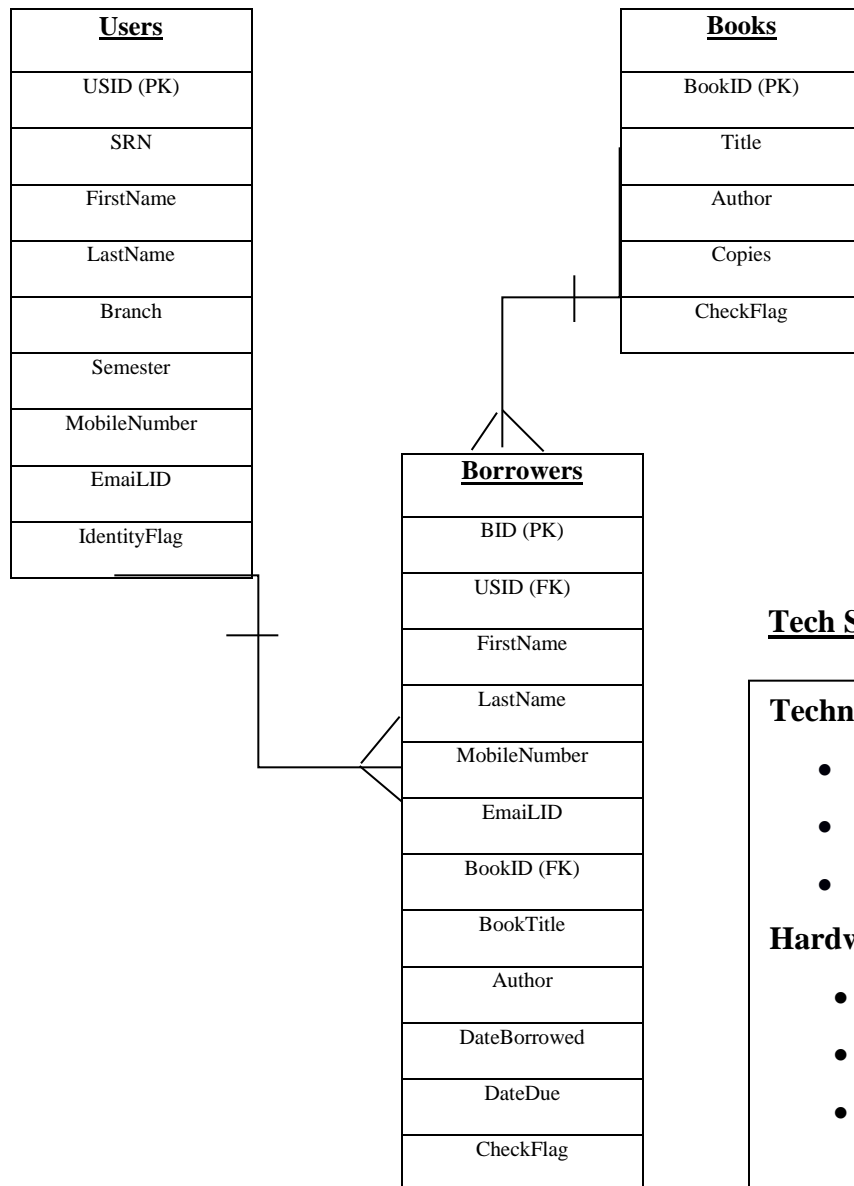
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ER Diagram:



Tech Stack:

Technology Stack Details:

- Windows 10++
- MySQL
- PyCharm

Hardware Components:

- Processor – i3++
- Hard Disk – 5 GB++
- Memory – 1GB RAM+



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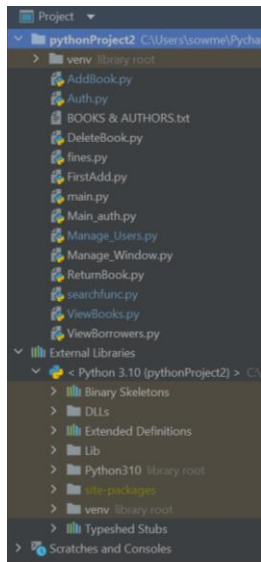
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Implementation: we have used Python as language for Coding; and our source code crosses 2000+ Lines of Code (across all the application code project files) – and hence we will be embedding snippets of Code below; and complete source code has been checked-into GITHUB Repository and link has been provisioned below

Below are the **Project Files**: there are 14 Project Files created; 12 User Interface (UI) Screens created; and few External Libraries used



**Project
Files**

Entire source code has been checked-in and version controlled in GITHUB @ <https://github.com/SowmeshSharma0411/CSProject.git> ; below are the major Project Files:

- **main.py** – which does function call to all other python files
- **AddBook.py** – Contains Logic to add the book
- **ViewBooks.py** – To View the list of books in the library
- **DeleteBook.py** – To Delete a book from library
- **ReturnBook.py** – To Return a book to the library
- **ViewBorrowers.py** – To View & Manage the Borrowers and their details
- **SearchFunction.py** – a common reusable function used across various pages
- **ManageUsers.py** – to manage users if the web application
- **Auth.py and MainAuth.py** – used for authentication & authorization
- **Fines.py** – to manage Fines for the Books which are past-due



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Testing:

Test Strategy: We have planned for Manual Functional Testing and Integration Testing for now; and for later stages (once we develop the complete Application full-fledge) – we intend to bring-in Non-Functional Requirement (NFR) Test Strategies like Security, Performance Testing

Manual Test cases have been created as below:

Test Case #	Test Case Description	Expected Response	Test Results / Comments
Func0001	Key-in UserID and Password and click on Login (correct UserID and Password)	User should be able to login and user is presented with a Dashboard / Landing Page with Functionalities to click (Features are: Manage Books, Manage Borrowers, Manage Users, Quit and Alert with # of users delayed returning Books with due date)	PASS
Func0002	Key-in UserID and Password and click on Login (incorrect UserID and Password)	Application will throw an error message and NOT login the user to Application	FAIL
Func0003	User's Dashboard with functionalities for Librarian to manage Books / Manage Borrowers	Librarian / User is presented with a Dashboard / Landing Page with Functionalities enabled & to click (Manage Books, Manage Borrowers, Manage Users, Quit and Alert with # of users delayed returning Books with due date, Logout, Help)	PASS
Func0004	User clicks on Manage Books in Dashboard Screen	User should be presented with a Manage Books page with features like View Books, Add Books, Edit Books, Delete Books, and Quit	PASS
Func0005	User clicks on View Books in Manage Books Screen	User should be presented with a View Books page with search facilities to search Books by various parameters like Book Name, Author, etc., etc.	PASS
Func0006	User clicks on Add Books in Manage Books Screen	User should be presented with a Add Books page with fields to add details for a new book like Book Name, Author, Category, Department and Related Details; then Buttons to click on save - to Save data to Database and Quit the page	PASS
Func0007	User clicks on Edit Books in Manage Books Screen	User should be presented with an Edit Books page with fields to edit details for a new book like Book Name, Author, Category, Department and Related Details; then Buttons to click on save - to Save data to Database and Quit the page	PASS
Func0008	User clicks on Delete Books in Manage Books Screen	User should be presented with a Delete Books page to delete record from DB	PASS
Func0009	User clicks on Manage Borrowers in Dashboard Screen	User should be presented with a Manage Borrowers page with features like View Borrowers, Add Borrowers, Edit Borrowers, Delete Borrowers, and Quit	PASS



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Func00010	User clicks on View Borrowers in Manage Borrowers Screen	User should be presented with a View Borrowers page with search facilities to search Borrowers by various parameters like Borrowers First Name, Borrowers Last Name, etc., etc.	PASS
Func00011	User clicks on Issue Books in Manage Borrowers Screen	User should be presented with a Add Borrowers page with fields to add details for a new Borrowers like Borrowers Name, and Related Details; then Buttons to click on save - to Save data to Database and Quit the page (he also has an option to search for the book and auto fetch the name using SRN)	PASS
Func00012	User clicks on Return Books in Manage Borrowers Screen	User should be presented with an Return Book page with fields such Borrowers Name, and Related Details; then Buttons to click on save - to Save data to Database and Quit the page	PASS
Func00013	User clicks on Manage Users in Dashboard Screen	User should be presented with a Manage Users page with features like View Users, Add Users, Edit Users, Delete Users, and Quit	PASS
Func00014	User clicks on View Users in Manage Users Screen	User should be presented with a View Users page with search facilities to search Users by various parameters like First Name, Last Name, etc., etc.	PASS
Func00015	User clicks on Add Users in Manage Users Screen	User should be presented with a Add Users page with fields to add details for a new Users like First Name and Related Details; then Buttons to click on save - to Save data to Database and Quit the page	PASS
Func00016	User clicks on Edit Users in Manage Books Users	User should be presented with an Edit Users page with fields to edit details for an existing Users like First Name and Related Details; then Buttons to click on save - to Save data to Database and Quit the page	PASS
Func00017	User clicks on Delete Users in Manage Users Screen	User should be presented with a Delete Users web page to delete record from DB	PASS
Func00018	User clicks on Quit button to quit any screen and also logout of Application	User should be able to click on Quit button on each screen to take him / her back-to Dashboard Page; and when suer clicks on Quit on Dashboard Page will be logged out of the Application	PASS



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Result and Analysis: There are 12 UI screens developed as below (we have sequenced the screen shots as per the application Use Cases / Application Functional Flow):

The image displays two screenshots of a web application interface for a library management system.

The top screenshot, titled "Login Page", features a bright orange background. At the top center, a black rectangular box with a yellow border contains the text "WELCOME TO MY LIBRARY" in white, bold, uppercase letters. Below this, there are two black rectangular buttons with white text: "Login" on the left and "Quit" on the right.

The bottom screenshot, titled "Library", also has an orange background. At the top center, a black rectangular box with a yellow border contains the text "My Library" in white, bold, uppercase letters. Below this, there is a black rectangular area containing a login form. The form has two input fields: "Username" and "Password", each followed by a white rectangular input box. Below the input fields are two light gray rectangular buttons with black text: "Submit" on the left and "Quit" on the right.



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Authentication Screen



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Dashboard Screen

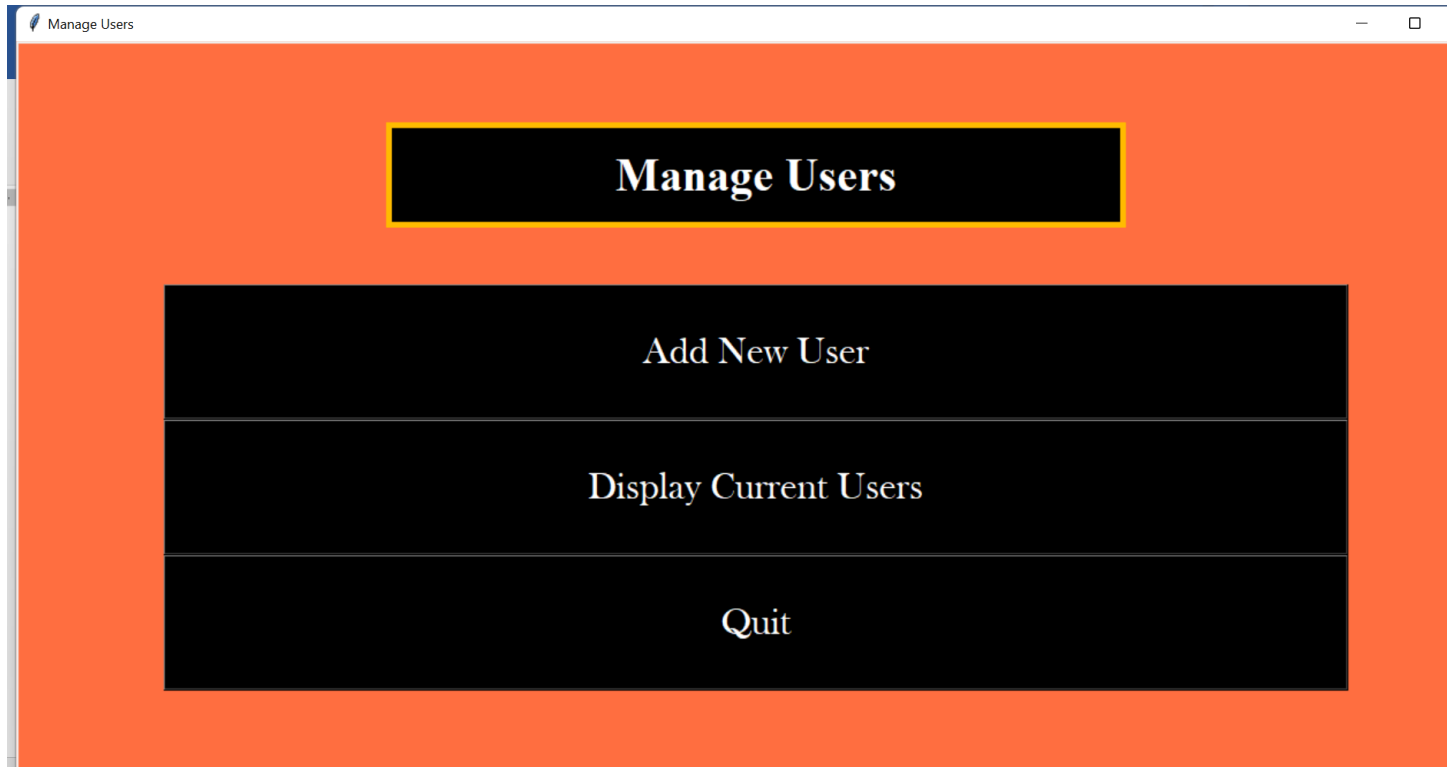


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Manage Users Screen



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View User

Search Type

Sl no	srn	name	last name	branch	Semester	Phone Number	Email ID
1	690	Sowmesh	Sharma	CSE	1	8618988127	sowmeshshailesh1234@gr
2	691	Shailesh	Sharma	CSE	1	9998283746	shailesh123@gmail.com
3	213	Naruto	Uzumaki	Mechanical Engineering	6	8718711237	naruto@gmail.com
4	567	Suhas	P Shroff	CSE	1	5638990911	suhas@gmail.com
5	888	abcd	aa	EEE	4	9087654211	abcd@gmsil.com
6	890	Sowmesh	Shroff	Biotechnology	8	6678757123	shroff@gmail.com

View Users Screen

Add User

Add User

First Name

Last Name

SRN

Branch

Semester

Mobile No

Email ID

Add Users Screen




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Manage Books

Add Books

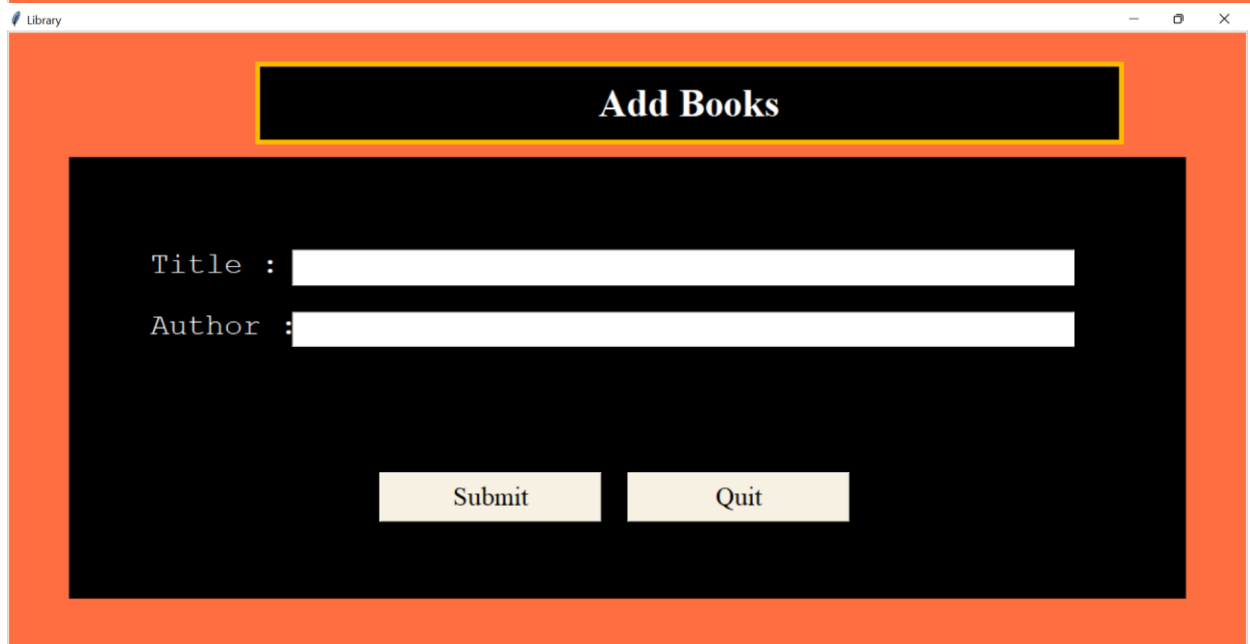
Delete Books

View Books

Quit

The 'Manage Books' screen features a bright orange background. At the top, a black rectangular button with a yellow border contains the text 'Manage Books' in white. Below this, a black rectangular area contains four white buttons stacked vertically: 'Add Books', 'Delete Books', 'View Books', and 'Quit'.

Manage Books Screen



Add Books

Title :

Author :

Submit Quit

The 'Add Books' screen has an orange background. At the top, a black button with a yellow border is labeled 'Add Books'. Below it, a black rectangular area contains two white text input fields. The first is labeled 'Title :' and the second is labeled 'Author :'. At the bottom of this area, there are two white buttons: 'Submit' and 'Quit'.

Add Books Screen



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View Books

Search Type

BID	Title	Author
1	Concrete Engineering Mathematics	Ronald Graham
2	The Art of Computer Programming	Donald Knuth
3	Structure and Interpretation of Computer Programs	Harold Abelson
4	Structured Computer Organization	Andrew S Tanenbaum
5	Benchmarking Functional Languages	Pieter H Hartel
6	Automatic Program Synthesis	Zohar Manna
7	Logic for Problem Solving	Kowalski
8	Clean Code	Robert C Martin
9	Introduction to Algorithms	Thomas H Cormen
10	Design Patterns	Richard Helm
11	Python	Charles Dierbach
12	The Pragmatic Programmer	Andrew Hunt
13	The C Programming Language	Dennis R Itchie
14	OOP with C++	E Balaguruswamy
15	Beginners Guide to C	Greg Perry

View Books Screen

Library

Delete Book

Book Title {Structure and Interpretation of Computer Programs }

Author { Harold Abelson }

Delete Books Screen



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The image displays two screenshots of a web-based Library Management System. The top screenshot shows the 'Manage Borrowers Screen' with a search for 'Py' returning a list of books including 'A Bite of Python'. The bottom screenshot shows the 'Manage Books Screen' with a search for 'Py' returning a list of books including 'A Bite of Python'.

LIBRARY MANAGEMENT SYSTEM

LIBRARY MEMBER INFORMATION

Member Type:
SRN No: **Fetch**
First Name:
Last Name:
Book ID:
Book Title:
Author:

BOOK DETAILS

Search: **Go**

{Concrete Engineering Mathematics }
{The Art of Computer Programming }
{Structure and Interpretation of Computer Programs }
{Structured Computer Organization }
{Benchmarking Functional Languages }
{Automatic Program Synthesis }
{Logic for Problem Solving }
{Clean Code }
{ Introduction to Algorithms }
{ Design Patterns }
{ Python }
{ The Pragmatic Programmer }
{ The C Programming Language }
{ OOP with C++ }
{ Beginners Guide to C }
{ JavaScript for Beginners }
{ The Art of Invisibility }

Issue Return Display Borrowers Reset Exit

LIBRARY MANAGEMENT SYSTEM

LIBRARY MEMBER INFORMATION

Member Type: Student
SRN No: 690 **Fetch**
First Name: Sowmesh
Last Name: Sharma
Book ID: 45
Book Title: A Bite of Python
Author: C H Swaroop

BOOK DETAILS

Search: Py **Go**

{ Python }
{ Python Crash Course }
{ Automate with Python }
{ Learning Python }
{ A Bite of Python }
{ ML with Pyhton }
{ Fluent Python }
{ Learn Python the Hard Way }

Issue Return Display Borrowers Reset Exit

Manage Borrowers Screen

Manage Books Screen



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PythonGuides

View Borrowers

Search Type

SRN	FirstName	LastName	Email	BookID	BookTitle	Author	DateBorrowed	datedue
690	Sowmesh	Sharma	sowmeshshailesh1234@gmail.c	9	Introduction to Algorithms	Thomas H Cormen	2022-01-19	2022-02-02

ENG IN 23:45 31-01-2022

View Books Screen



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Conclusions & future enhancements

Conclusion:

A library management system is a web application designed to Digitize and Manage all the functions of a library end-to-end; This system can be used in public libraries; It can also be implemented in the library of schools, colleges, institutes, and organizations

We are Thankful to PESU to have provided this opportunity to venture into and create a full-fledged Web Application which was a very good start (Shree Ganesh) for us to do hands-on coding and also learn a lot along-the-way; We have envisioned much more user intuitive features to be added / enhanced to this web application (outlined in below-section) which we will take it up later

Future Enhancements: below are the list of Enhancements / Improvisations planned:

- Improve User Experience by making the web application with Responsive Web Page Design
- Enhance the Web Application to support Mobile Screens
- If possible, make it Android or iOS Enabled
- Enhance features to include:
 - Better full-fledged Authentication & Authorization for user; and also encrypting / decrypting the Password (For Security)
 - Add feature for Students to use this Application (now we have implemented for Librarian only)
 - Further Intelligence (like automated reminders, trigger notifications to defaulters)
 - Add Reporting features, with customizable Report Templates
 - Add Alerts (like SMS) and Notifications (like email)
 - Add / Enable feature for Subscriptions; notify students when new Books arrive
 - Code provisions for e-Books (reading & management) within the Application
- Bring-in other Test Strategies for Non-Functional Requirements like Security Testing, Performance Testing



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References and Appendix:

We have drawn inspiration from below websites and would like to sincerely Thank them:

- Data Flair (<https://data-flair.training/>)
- You Tube Video (<https://www.youtube.com/watch?v=GODYXAnBDvc&t=5081s>)

Please note: though we took inspiration from above, we have completely written the source code and business logic from scratch