



UE21CS352B - Object Oriented Analysis & Design using Java

Mini Project Report

“Library Management system”

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Designation

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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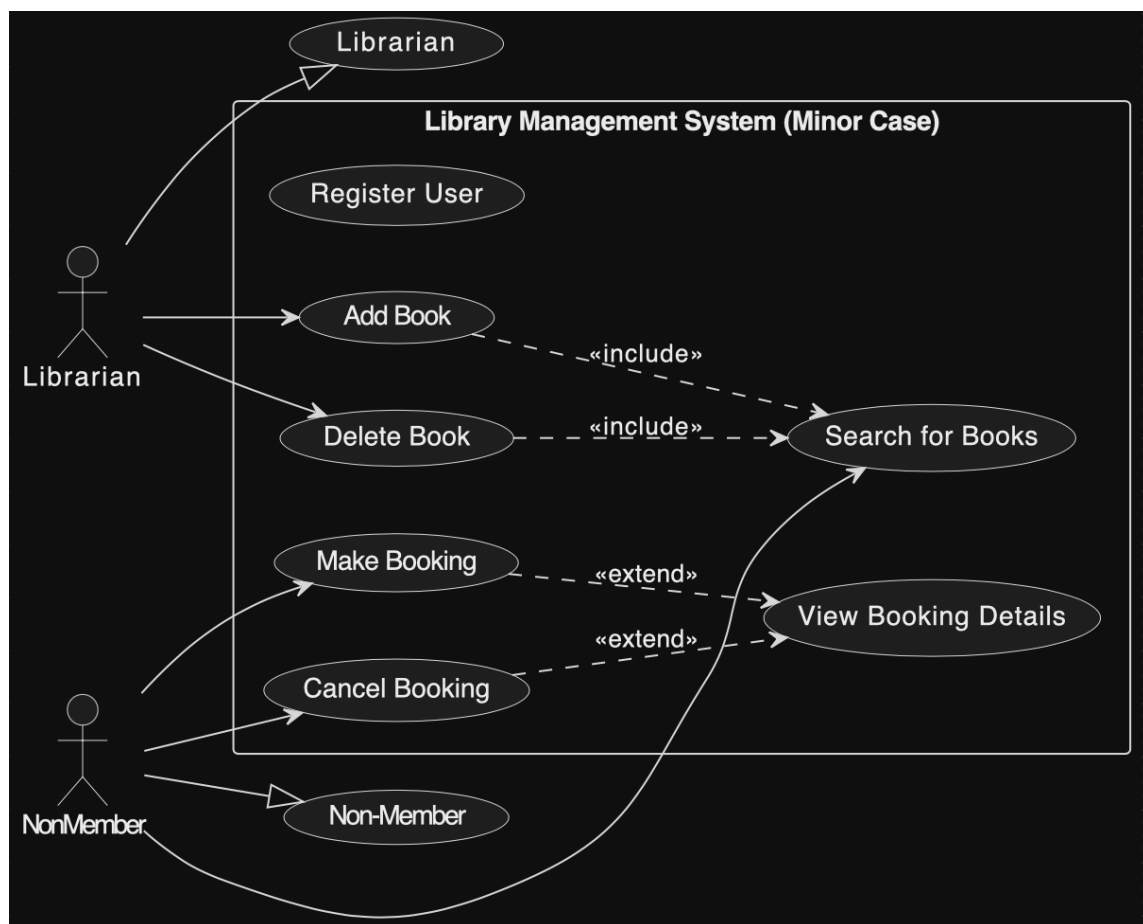
(Established under Karnataka Act No. 16 of 2013)
100ft Ring Road, Bengaluru – 560 085, Karnataka, India

1. Problem Statement (synopsis)

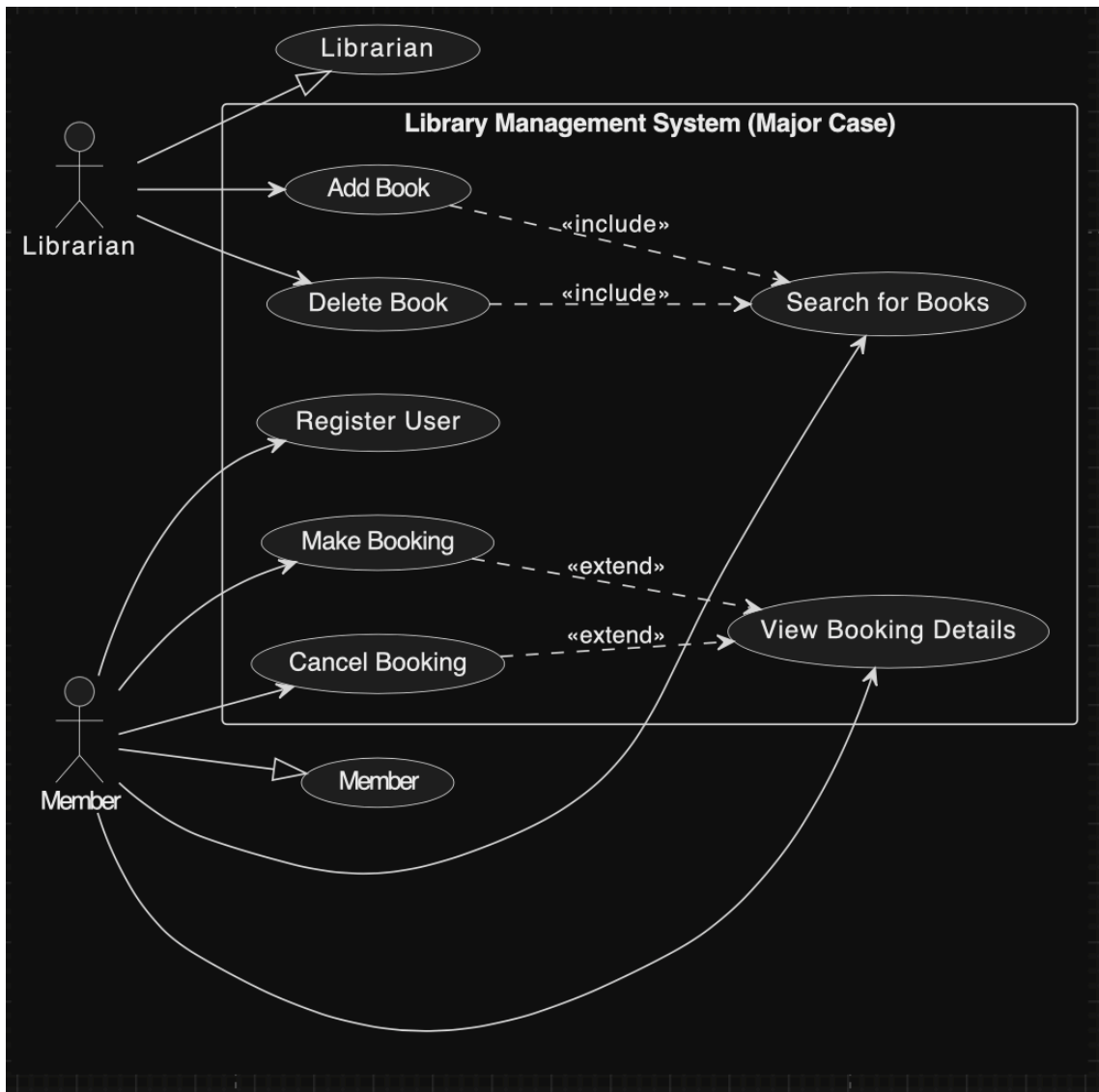
This library management system aims to streamline the operations of a library by providing an efficient and user-friendly platform for librarians, members, and non-members (guests) to access and manage library resources.

2. Models

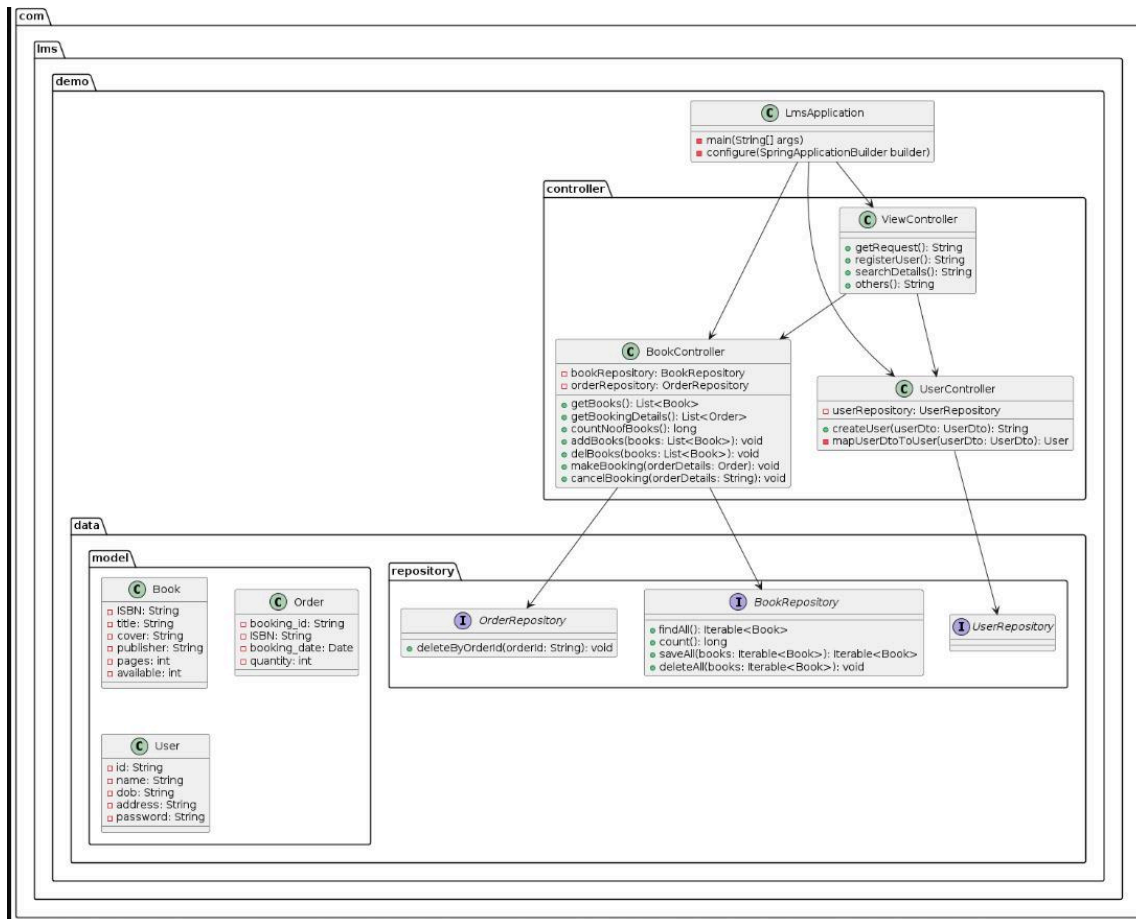
Minor - Use case



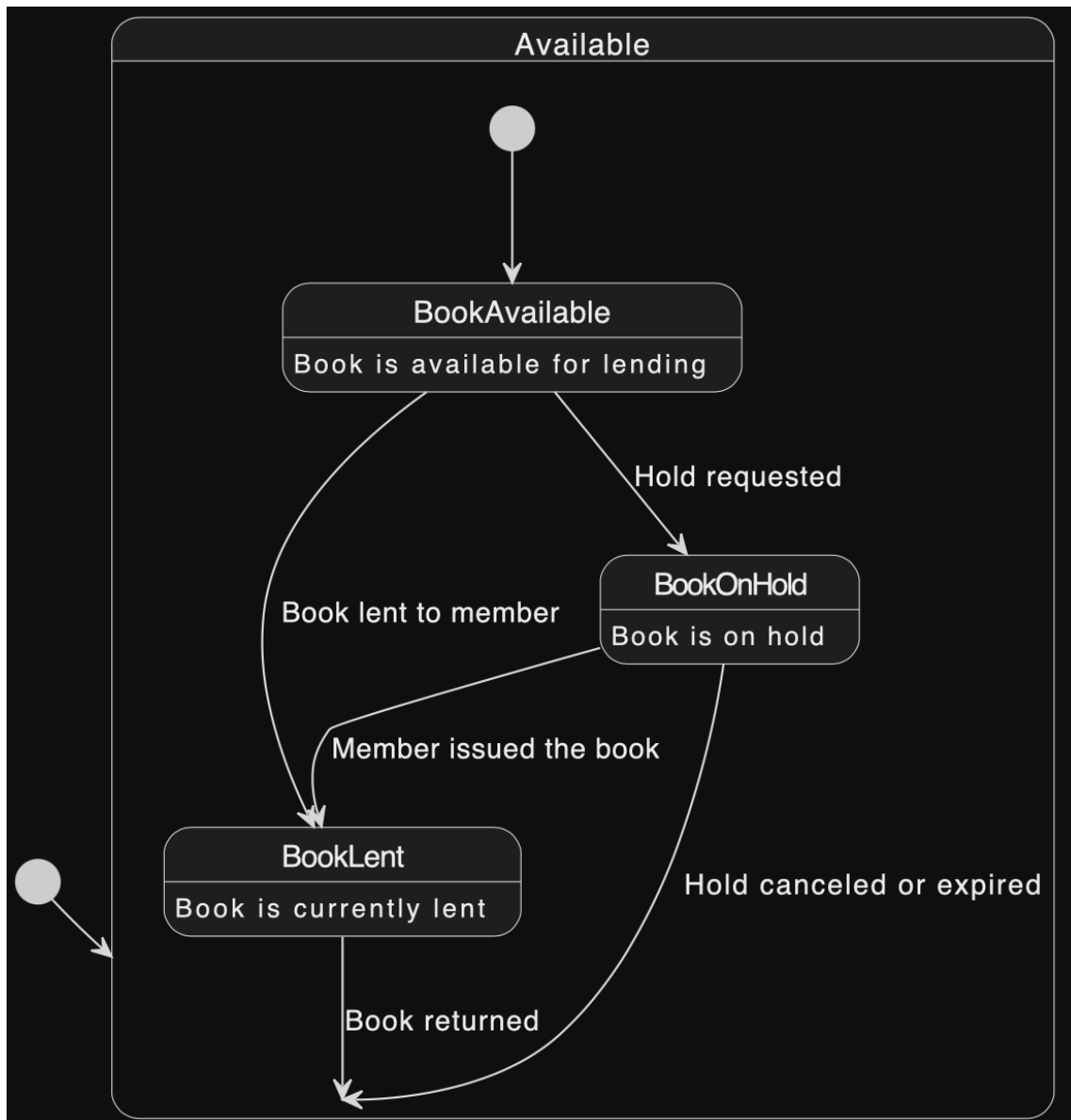
Major- Use case



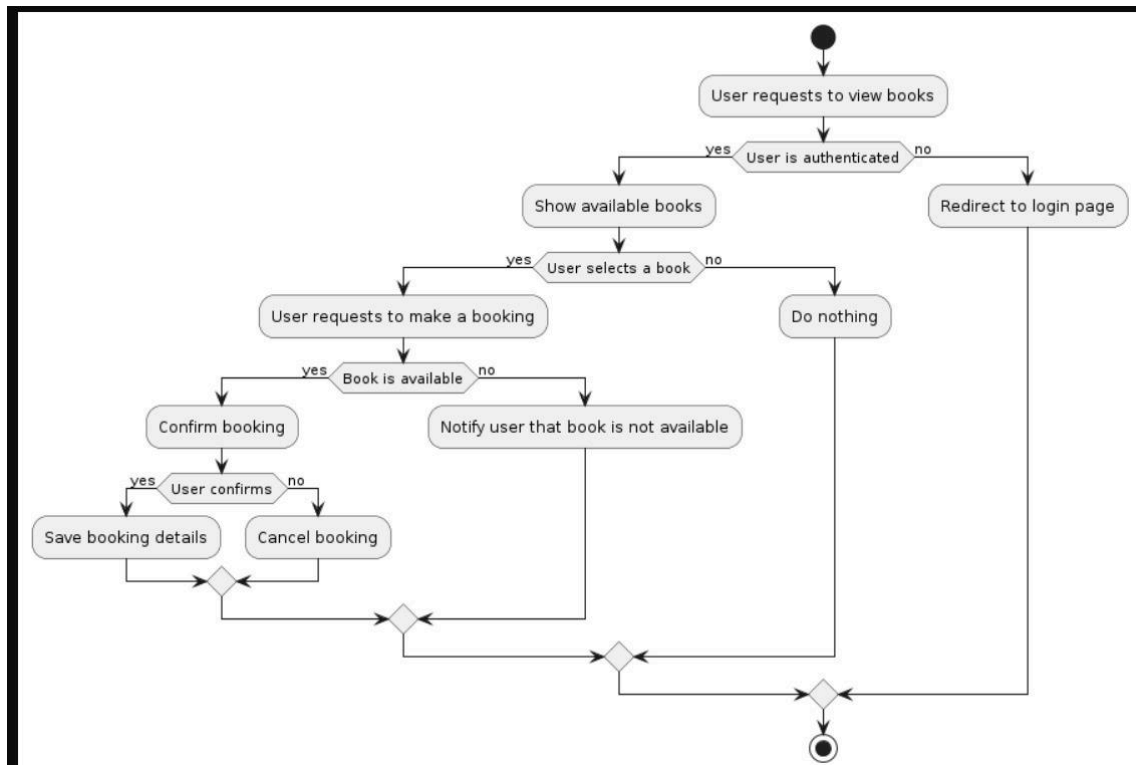
Class Models



State Diagram



Activity Diagram



3. Architecture and design patterns used

1. Single Responsibility Principle (SRP): The Single Responsibility Principle (SRP) states that a class should have only one reason to change, meaning it should have only one job or responsibility. This principle helps in keeping classes focused and manageable, reducing complexity and making the codebase easier to understand, maintain, and extend.

Each class in our codebase has a specific task:

- Controllers (e.g., `BookController`, `UserController`, `ViewController`) handle HTTP requests and views.
- Model classes (`Book`, `Order`, `User`) manage data and behavior for specific entities.
- Repository interfaces (`BookRepository`, `OrderRepository`, `UserRepository`) deal with data access operations.
- The `UserDto` class acts as a data transfer object between layers.
- We've organized our code to ensure each class focuses on its designated role, keeping things clear and manageable

2. Dependency Injection (DI): Dependency Injection (DI) is a design pattern used to remove hard-coded dependencies between classes by injecting dependencies from external sources. This promotes loose coupling and facilitates easier testing, scalability, and flexibility in the application.

- In the `UserController` class, we inject the `UserRepository` dependency via constructor injection.
- This allows us to easily swap dependencies or mock them for testing purposes, enhancing the flexibility and testability of our code.

3. Open/Closed Principle (OCP): The Open/Closed Principle (OCP) states that software entities (classes, modules, functions, etc.) should be open for extension but closed for

modification. This means that existing code should be easily extensible without requiring changes to its source code.

Classes are structured to allow for extending functionality without modifying existing code.

This promotes modularity and reusability, as new features can be added without risking unintended side effects in existing code.

4. Model-View-Controller (MVC) Pattern: The Model-View-Controller (MVC) pattern is a widely used architectural pattern for designing user interfaces. It divides an application into three interconnected components: Model (data and business logic), View (presentation layer), and Controller (handles user input and updates the model and view).

Models (**Book**, **Order**, **User**) handle data and business logic.

Views are managed by the **ViewController** class, handling view-related logic.

Controllers (**BookController**, **UserController**) manage HTTP requests and interact with models and views.

5. Repository Pattern: The Repository pattern is a design pattern that separates the logic that retrieves data from a data source (such as a database) from the business logic in the application. It provides a layer of abstraction for data access operations, making it easier to switch between different data sources or databases.

Repository interfaces (**BookRepository**, **OrderRepository**, **UserRepository**) abstract database operations.

They define CRUD operations for entities, decoupling application logic from data storage mechanisms.

Spring Data JPA simplifies repository implementation, reducing boilerplate and enhancing maintainability.

6. Data Access Object (DAO) Pattern: The Data Access Object (DAO) pattern is a design pattern that separates the data access code from the business logic in an application. It provides an abstract interface to access data stored in a database or other data sources.

Model classes (**Book**, **Order**, **User**) represent data entities.

Repository interfaces (`BookRepository`, `OrderRepository`, `UserRepository`) encapsulate data access logic.

This separation ensures clear responsibilities and promotes maintainability and testability.

7. Data Transfer Object (DTO) Pattern: The Data Transfer Object (DTO) pattern is a design pattern used to transfer data between software application subsystems or layers. It typically consists of simple data structures with no business logic.

We employ the DTO pattern for efficient data transfer between layers:

- The `UserDto` class carries user-related data between different parts of the application.
- DTOs like this simplify communication and reduce the amount of data transferred.
- Using Lombok's `@Builder` annotation streamlines DTO creation, improving readability and reducing boilerplate code.

4. Github Repository Link:

<https://github.com/SandeepRam31/OOAD>

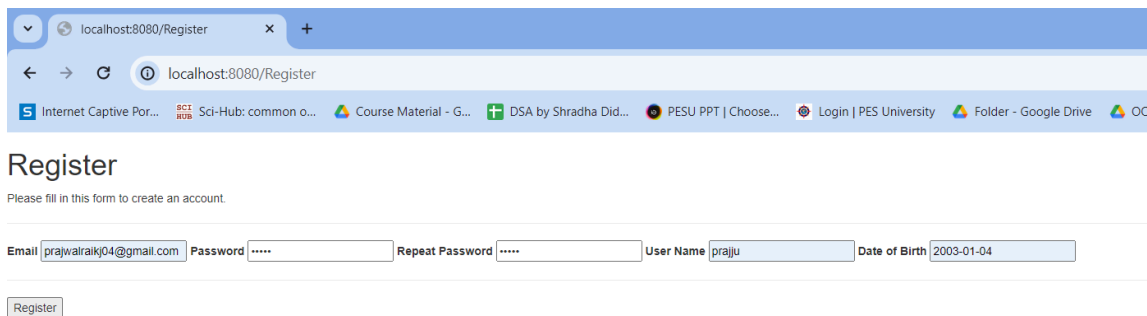
5. Individual Contributions:

- **Prajwal Rai:** Designed the overall design patterns and principles to be used in the project, and developed the register, login, and search pages for the application. Ensuring connectivity to the backend and implementing 'Search all book details' and 'Number of books' functionalities.

- **Sandeep Ram:** Implemented Spring book frame work and set up the apis to link the front end to the back end. Implemented the logic for Add New Book, Bookings and Cancel Booking.
- **Kriti Sujeeth:** Implemented the front end design as well as database schema. Created the use case (minor and major) and State diagrams relevant for this project.
- **Jyotiraditya:** Created the Class and activity diagrams, developed the makebooking and delete booking functionalities along with database.

6. Screenshots with input values:

- **Register page:**



localhost:8080/Register

localhost:8080/Register

Internet Captive Por... Sci-Hub: common o... Course Material - G... DSA by Shradha Did... PESU PPT | Choose... Login | PES University Folder - Google Drive OC

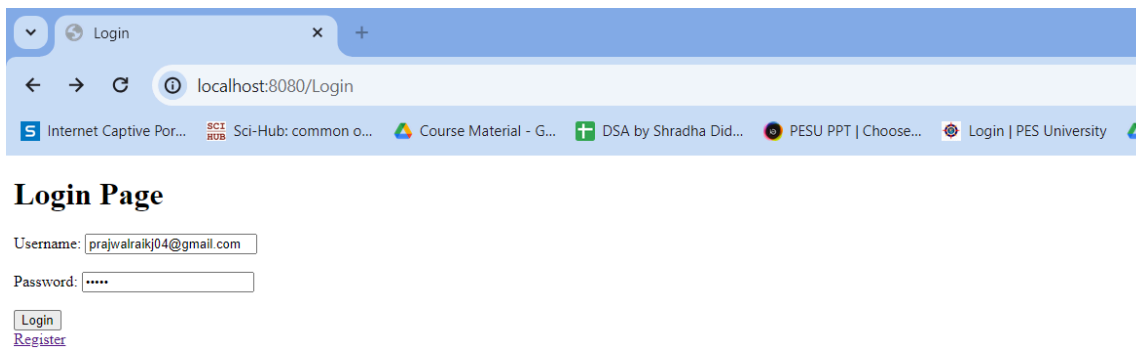
Register

Please fill in this form to create an account.

Email Password Repeat Password User Name Date of Birth

Output: User info entered in the database

- **Login page:**



The screenshot shows a web browser window with the address bar displaying 'localhost:8080/Login'. The browser's tab is titled 'Login'. The page content includes a 'Login Page' heading, a 'Username:' label with a text input field containing 'prajwalraikj04@gmail.com', a 'Password:' label with a password input field showing six dots, a 'Login' button, and a 'Register' link.

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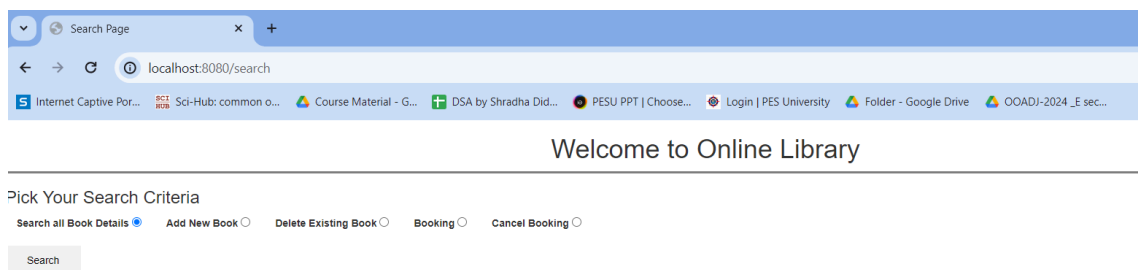
Login Page

Username:

Password:

[Register](#)

- **Home page:**



The screenshot shows a web browser window with the address bar displaying 'localhost:8080/search'. The browser's tab is titled 'Search Page'. The page content includes a 'Welcome to Online Library' heading, a 'Pick Your Search Criteria' section with five radio buttons, and a 'Search' button.

Internet Captive Por... Sci-Hub: common o... Course Material - G... DSA by Shradha Did... PESU PPT | Choose... Login | PES University Folder - Google Drive OOADJ-2024_E sec...

Welcome to Online Library

Pick Your Search Criteria

☒ Search all Book Details ☐ Add New Book ☐ Delete Existing Book ☐ Booking ☐ Cancel Booking

- **Search Book Function:** The user can search for the book of his/her liking from the collection of books available:

```
mysql> select * from user;
+-----+-----+-----+-----+-----+
| id          | address                | dob       | name  | password |
+-----+-----+-----+-----+-----+
| 402880388f0baee8018f0bc5782d0002 | prajwalraikj04@gmail.com | 2003-01-04 | prajju | hello    |
+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)

mysql>
```

Welcome to Online Library

Pick Your Search Criteria

Search all Book Details ☒ Add New Book ☐ Delete Existing Book ☐ Booking ☐ Cancel Booking ☐

Search

Book E-code	Title	Cover	Publisher	No of Pages	No of Books Available
663	Kalil	Stoeck	kstoeckie@nhs.gov	663	127
664	Dion	Reyna	dreynaif@dion.ne.jp	664	127
666	Fiona	Unitt	funittth@zimbio.com	666	127
667	Yank	Leggatt	yleggattii@foxnews.com	667	127
668	Cherye	Jlrek	cjlrekj@army.mil	668	127
672	Lowrance	Crone	lcronein@reference.com	672	127
673	Robina	Pogoslan	rpogoslanio@usda.gov	673	127
674	Gardener	Tinsey	gtinseyip@adobe.com	674	127
675	Philippine	Renton	prentonik@prweb.com	675	127

First Previous 1 2 3 4 5 Next Last

- **Add Book function:** The Librarian can add a book to the database.

Welcome to Online Library

Pick Your Search Criteria

Search all Book Details ☐ Add New Book ☒ Delete Existing Book ☐ Booking ☐ Cancel Booking ☐

Search

Enter Book Details here

Book E-code	Title	Cover	Publisher	No of Pages	No of Books Available
1104	gbzsvjksf	ffgshsh	ssgbhag	100	100

Add Row Remove Row Submit Data

```
MySQL 8.0 Command Line Cli x + v
| 999 | Mack | Gaspero | mgasperorq@umn.edu | 999 | -98 |
+-----+-----+-----+-----+-----+-----+
272 rows in set (0.00 sec)

mysql> select * from book;
+-----+-----+-----+-----+-----+-----+
| ISBN | title | cover | publisher | pages | available |
+-----+-----+-----+-----+-----+-----+
| 1100 | jygj | dsred | uvghf | 1100 | 20 |
| 1104 | gbzsvjksf | ffgshsh | ssbghag | 100 | 100 |
| 1188 | hfghf | hgffhg | fhgdt | 69 | 29 |
| 664 | Dion | Reyna | dreynaif@dion.ne.jp | 664 | 127 |
| 666 | Fiona | Unitt | funittih@zimbio.com | 666 | 127 |
| 667 | Yank | Leggatt | yleggattii@foxnews.com | 667 | 127 |
| 668 | Cherye | Jirek | cjirekij@army.mil | 668 | 127 |
| 672 | Lowrance | Crone | lcronein@reference.com | 672 | 127 |
+-----+-----+-----+-----+-----+-----+
```

- **Delete Book function:** The librarian can delete a book from the database using this function:

Before deleting:

Search Page

localhost:8080/search

Internet Captive Por...

Sci-Hub: common o...

Course Material - G...

DSA by Shradha Did...

PESU PPT | Choose...

Login | PES University

Folder - Google Drive

OOADI-2024_E_sec...

Welcome to Online Library

Pick Your Search Criteria

Search all Book Details

Add New Book

Delete Existing Book

Booking

Cancel Booking

Search

Pick Books to delete

Pick	Book E-code	Title	Cover	Publisher	No of Pages	No of Books Available
<input type="checkbox"/>	664	Dion	Reyna	dreynaif@dion.ne.jp	664	127
<input type="checkbox"/>	666	Fiona	Unitt	funittih@zimbio.com	666	127
<input type="checkbox"/>	667	Yank	Leggatt	yleggattii@foxnews.com	667	127
<input type="checkbox"/>	668	Cherye	Jirek	cjirekij@army.mil	668	127
<input type="checkbox"/>	672	Lowrance	Crone	lcronein@reference.com	672	127
<input type="checkbox"/>	673	Robina	Pogosian	rpogosianio@usda.gov	673	127
<input type="checkbox"/>	674	Gardener	Tinsey	gtinseyip@adobe.com	674	127
<input type="checkbox"/>	675	Phillipine	Renton	prentonig@prweb.com	675	127
<input type="checkbox"/>	676	Lyman	Scarlan	lscarlanir@hhs.gov	676	127

First

Previous

1

2

3

4

5

Next

Last

Delete Books

```
mysql> select * from book where isbn="664";
+-----+-----+-----+-----+-----+-----+
| ISBN | title | cover | publisher | pages | available |
+-----+-----+-----+-----+-----+-----+
| 664 | Dion | Reyna | dreynaif@dion.ne.jp | 664 | 127 |
+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

After deleting: Select the book to removed

Search Page

localhost:8080/search

Internet Captive Por...Sci-Hub: common o...Course Material - G...DSA by Shradha Did...PESU PPT | Choose...Login | PES UniversityFolder - Google DriveOOADJ-2024_E sec...

Welcome to Online Library

Pick Your Search Criteria

Search all Book Details ☐Add New Book ☐Delete Existing Book ☒Booking ☐Cancel Booking ☐

Search

Pick Books to delete

Pick	Book E-code	Title	Cover	Publisher	No of Pages	No of Books Available
<input checked="" type="checkbox"/>	664	Dion	Reyna	dreynalf@dion.ne.jp	664	127
<input type="checkbox"/>	666	Fiona	Unitt	funittth@zimbio.com	666	127
<input type="checkbox"/>	667	Yank	Leggatt	yleggattii@foxnews.com	667	127
<input type="checkbox"/>	668	Cherye	Jirek	cjirekjj@army.mil	668	127
<input type="checkbox"/>	672	Lowrance	Crone	lcronein@reference.com	672	127
<input type="checkbox"/>	673	Robina	Pogosian	rpogosianio@usda.gov	673	127
<input type="checkbox"/>	674	Gardener	Tinsey	gtinseyip@adobe.com	674	127
<input type="checkbox"/>	675	Philippine	Renton	prentonliq@prweb.com	675	127
<input type="checkbox"/>	676	Lyman	Scarlan	lscarlanin@hhs.gov	676	127

FirstPrevious12345NextLast

Delete Books

Click on Delete Books button

Search Page

localhost:8080/search

Internet Captive Por...Sci-Hub: common o...Course Material - G...DSA by Shradha Did...PESU PPT | Choose...Login | PES UniversityFolder - Google DriveOOADJ-2024_E sec...

Welcome to Online Library

Pick Your Search Criteria

Search all Book Details ☐Add New Book ☐Delete Existing Book ☒Booking ☐Cancel Booking ☐

Search

Pick Books to delete

Pick	Book E-code	Title	Cover	Publisher	No of Pages	No of Books Available
<input type="checkbox"/>	666	Fiona	Unitt	funittth@zimbio.com	666	127
<input type="checkbox"/>	667	Yank	Leggatt	yleggattii@foxnews.com	667	127
<input type="checkbox"/>	668	Cherye	Jirek	cjirekjj@army.mil	668	127
<input type="checkbox"/>	672	Lowrance	Crone	lcronein@reference.com	672	127
<input type="checkbox"/>	673	Robina	Pogosian	rpogosianio@usda.gov	673	127
<input type="checkbox"/>	674	Gardener	Tinsey	gtinseyip@adobe.com	674	127
<input type="checkbox"/>	675	Philippine	Renton	prentonliq@prweb.com	675	127
<input type="checkbox"/>	676	Lyman	Scarlan	lscarlanin@hhs.gov	676	127
<input type="checkbox"/>	677	Ruthann	Feriley	rferileyis@state.gov	677	127

FirstPrevious12345NextLast

Delete Books

Hey Your record submitted sucessfully....

```
mysql> select * from book where isbn="664";
Empty set (0.00 sec)
```

- **Booking function:** Allows the user to order a book.

Welcome to Online Library

Pick Your Search Criteria

☐ Search all Book Details
 ☐ Add New Book
 ☐ Delete Existing Book
 ☒ Booking
 ☐ Cancel Booking

Search

Pick Your Books..

ISBN	ISBN	ISBN	ISBN	ISBN	ISBN	ISBN	ISBN	ISBN
ISaaaaaaaaaaaaaa:666	ISaaaaaaaaaaaaaa:667	ISaaaaaaaaaaaaaa:668	ISaaaaaaaaaaaaaa:672	ISaaaaaaaaaaaaaa:673	ISaaaaaaaaaaaaaa:674	ISaaaaaaaaaaaaaa:675	ISaaaaaaaaaaaaaa:676	ISaaaaaaaaaaaaaa:
Title is:Fiona	Title is:Yank	Title is:Cherye	Title is:Lowrance	Title is:Robina	Title is:Gardener	Title is:Phillipine	Title is:Lyman	Title is:Rutha
Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127
Buy	Buy	Buy	Buy	Buy	Buy	Buy	Buy	Buy

First Previous 2 3 4 5 Next Last

```
mysql> select * from order_details;
+-----+-----+-----+-----+
| booking_id | ISBN | booking_date | quantity |
+-----+-----+-----+-----+
| 402880388f0b7c0d018f0b80019b0000 | 666 | 2024-04-23 | 666 |
| 402880388f1e15ce018f1e1bffa0000 | 666 | 2024-04-27 | 666 |
| ff80808162bf9a0d0162bf9dfc8a0008 | 663 | 2018-04-13 | 663 |
+-----+-----+-----+-----+
```

Clicking on the “Buy” button confirms the booking

Search Page

localhost:8080/search

Internet Captive Por... Sci-Hub: common o... Course Material - G... DSA by Shraddha Did... PESU PPT | Choose... Login | PES University Folder - Google Drive OOADJ:2024_F_sec... All Bookmarks

Welcome to Online Library

Pick Your Search Criteria

☐ Search all Book Details
 ☐ Add New Book
 ☐ Delete Existing Book
 ☒ Booking
 ☐ Cancel Booking

Search

Pick Your Books..

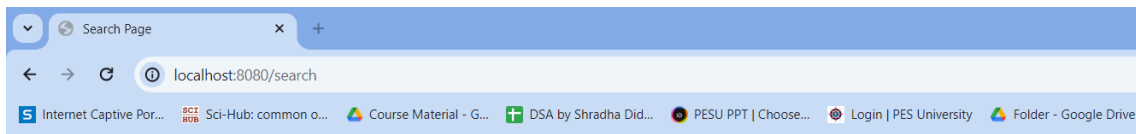
ISBN ISaaaaaaaaaaaaaaaa:666	ISBN ISaaaaaaaaaaaaaaaa:667	ISBN ISaaaaaaaaaaaaaaaa:668	ISBN ISaaaaaaaaaaaaaaaa:672	ISBN ISaaaaaaaaaaaaaaaa:673	ISBN ISaaaaaaaaaaaaaaaa:674	ISBN ISaaaaaaaaaaaaaaaa:675	ISBN ISaaaaaaaaaaaaaaaa:676	ISBN ISaaaaaaaaaaaaaaaa:677
Title is:Fiona	Title is:Yank	Title is:Cherye	Title is:Lowrance	Title is:Robina	Title is:Gardener	Title is:Philippine	Title is:Lyman	Title is:Ruthai
Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127	Amount:127
Buy	Buy	Buy	Buy	Buy	Buy	Buy	Buy	Buy

First Previous 1 2 3 4 5 Next Last

Your Booking is sucessfull

```
mysql> select * from order_details;
+-----+-----+-----+-----+
| booking_id | ISBN | booking_date | quantity |
+-----+-----+-----+-----+
| 402880388f0b7c0d018f0b80019b0000 | 666 | 2024-04-23 | 666 |
| 402880388f1e15ce018f1e1bffa0000 | 666 | 2024-04-27 | 666 |
| 402880388f1e15ce018f1e1fdab10001 | 672 | 2024-04-27 | 672 |
| ff80808162bf9a0d0162bf9dfc8a0008 | 663 | 2018-04-13 | 663 |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)
```

- **Cancel Booking:** The user can cancel the book that he had previously ordered using this functionality.



Welcome to Online Library

Pick Your Search Criteria

[Search all Book Details](#) [Add New Book](#) [Delete Existing Book](#) [Booking](#) [Cancel Booking](#)

Search

Cancel Your Booking

Booking Code:663 Booking date is:2024-04-22 Refund Amount:663 Cancel Order	Booking Code:666 Booking date is:2024-04-23 Refund Amount:666 Cancel Order	Booking Code:666 Booking date is:2024-04-27 Refund Amount:666 Cancel Order	Booking Code:663 Booking date is:2018-04-13 Refund Amount:663 Cancel Order
---	---	---	---

First Previous 1 Next Last

```
mysql> select * from order_details;
+-----+-----+-----+-----+
| booking_id | ISBN | booking_date | quantity |
+-----+-----+-----+-----+
| 402880388f0b7c0d018f0b80019b0000 | 666 | 2024-04-23 | 666 |
| 402880388f1e15ce018f1e1bffb0000 | 666 | 2024-04-27 | 666 |
| 402880388f1e15ce018f1e1fdab10001 | 672 | 2024-04-27 | 672 |
| ff80808162bf9a0d0162bf9dfc8a0008 | 663 | 2018-04-13 | 663 |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)
```

On clicking the cancel option, the order is cancelled.

Welcome to Online Library

Pick Your Search Criteria

Search all Book Details ☐ Add New Book ☐ Delete Existing Book ☐ Booking ☐ Cancel Booking ☒

Search

Cancel Your Booking

Booking Code:666	Booking Code:666	Booking Code:663
Booking date is:2024-04-23	Booking date is:2024-04-27	Booking date is:2018-04-13
Refund Amount:666	Refund Amount:666	Refund Amount:663
Cancel Order	Cancel Order	Cancel Order

First Previous 1 Next Last

Cancelled Sucessfully

```
mysql> select * from order_details;
```

booking_id	ISBN	booking_date	quantity
402880388f0b7c0d018f0b80019b0000	666	2024-04-23	666
402880388f1e15ce018f1e1bffa0000	666	2024-04-27	666
ff80808162bf9a0d0162bf9dfc8a0008	663	2018-04-13	663