Object Oriented Analysis and Design using Java
(UE20CS352)
Mini Project

Project Title: Library Management System

Section: K

Team Members:

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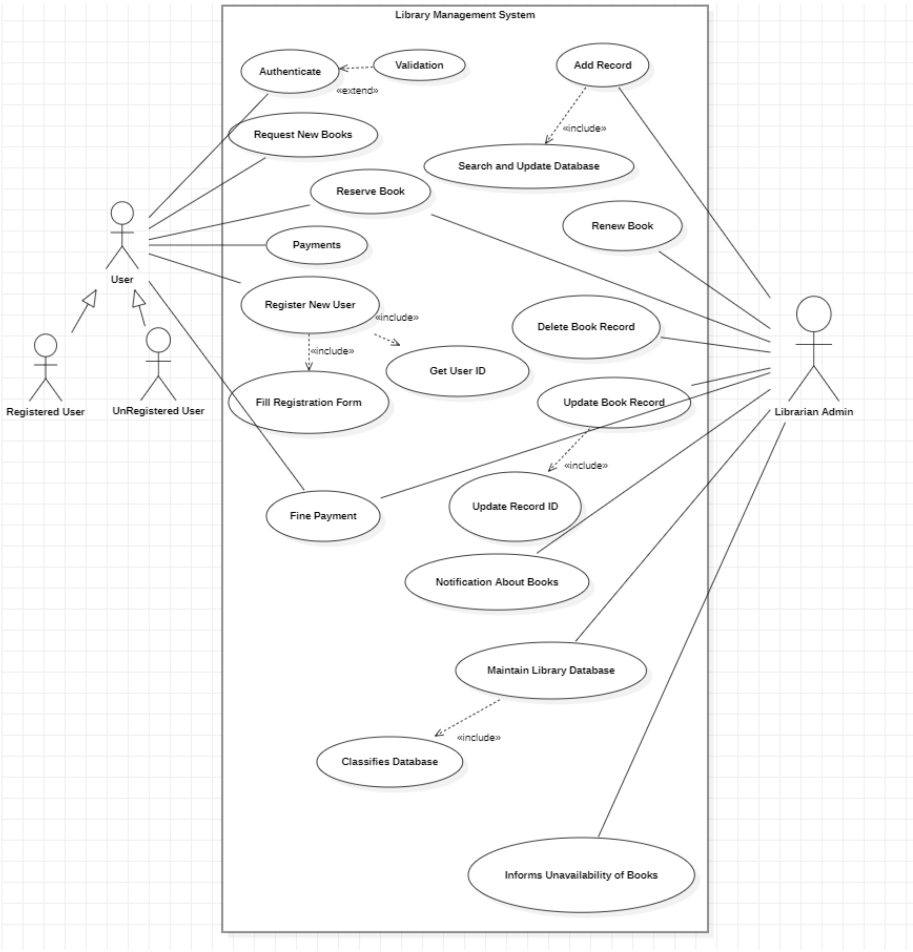
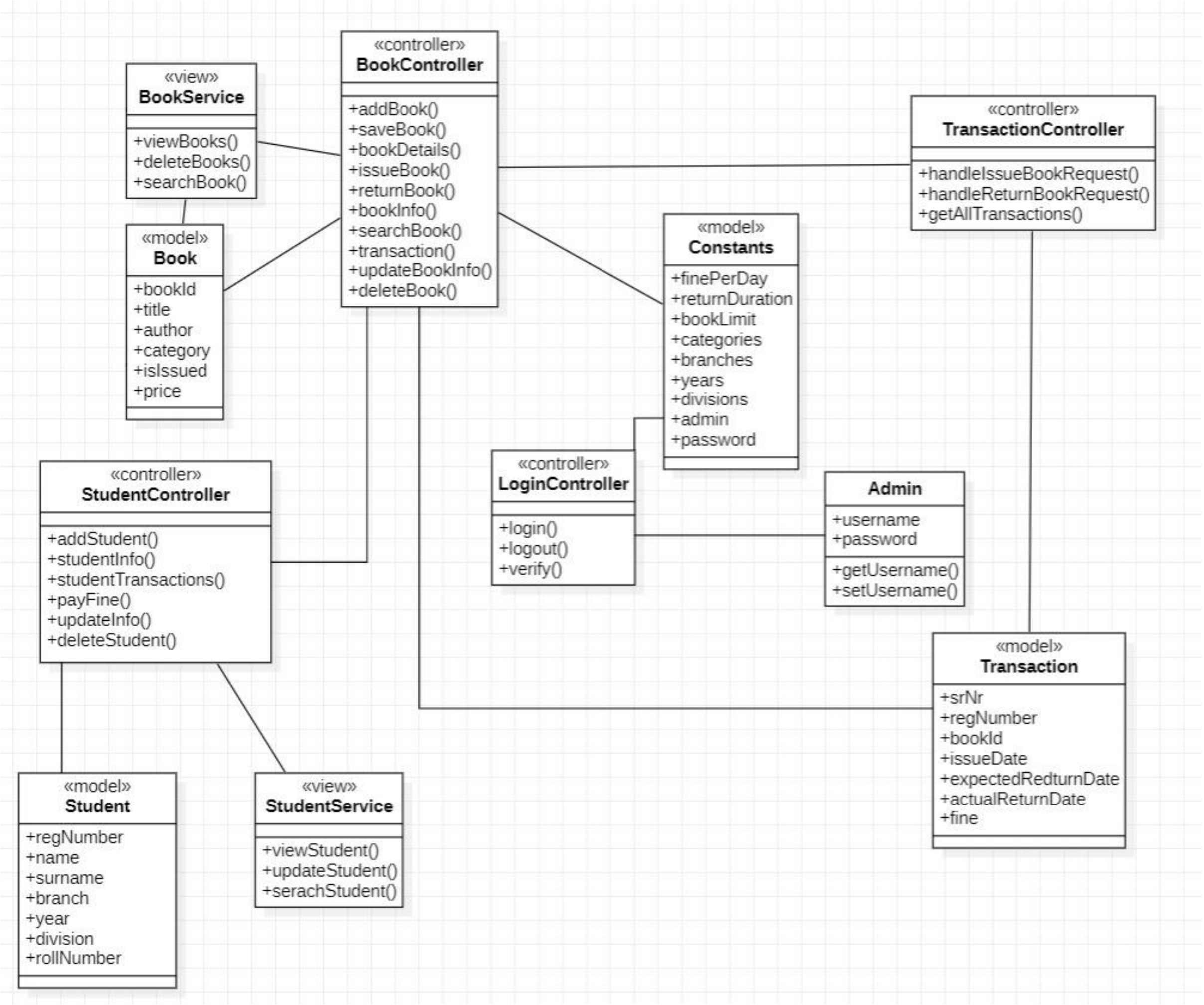
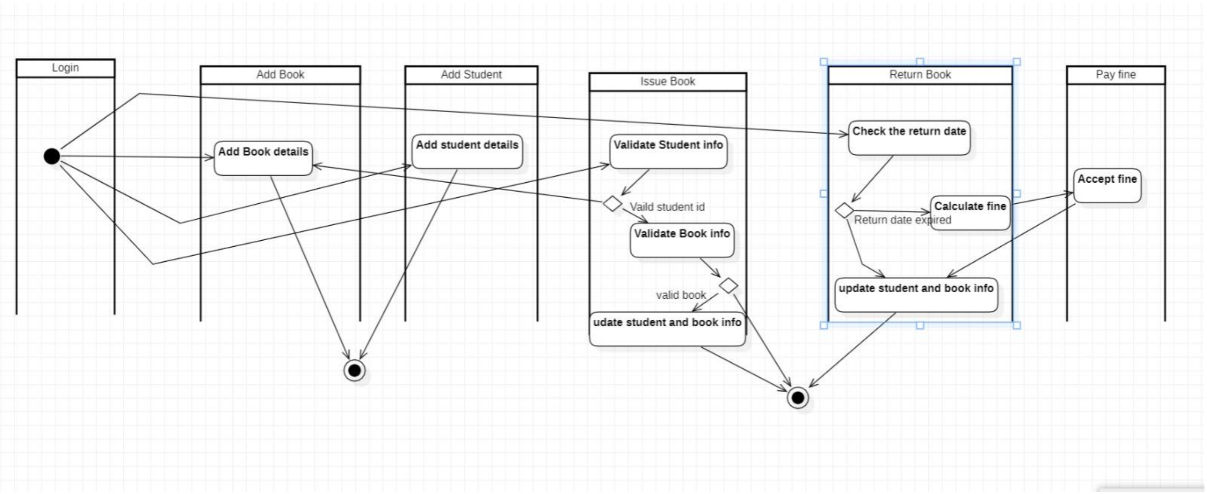
USE CASE DIAGRAM:



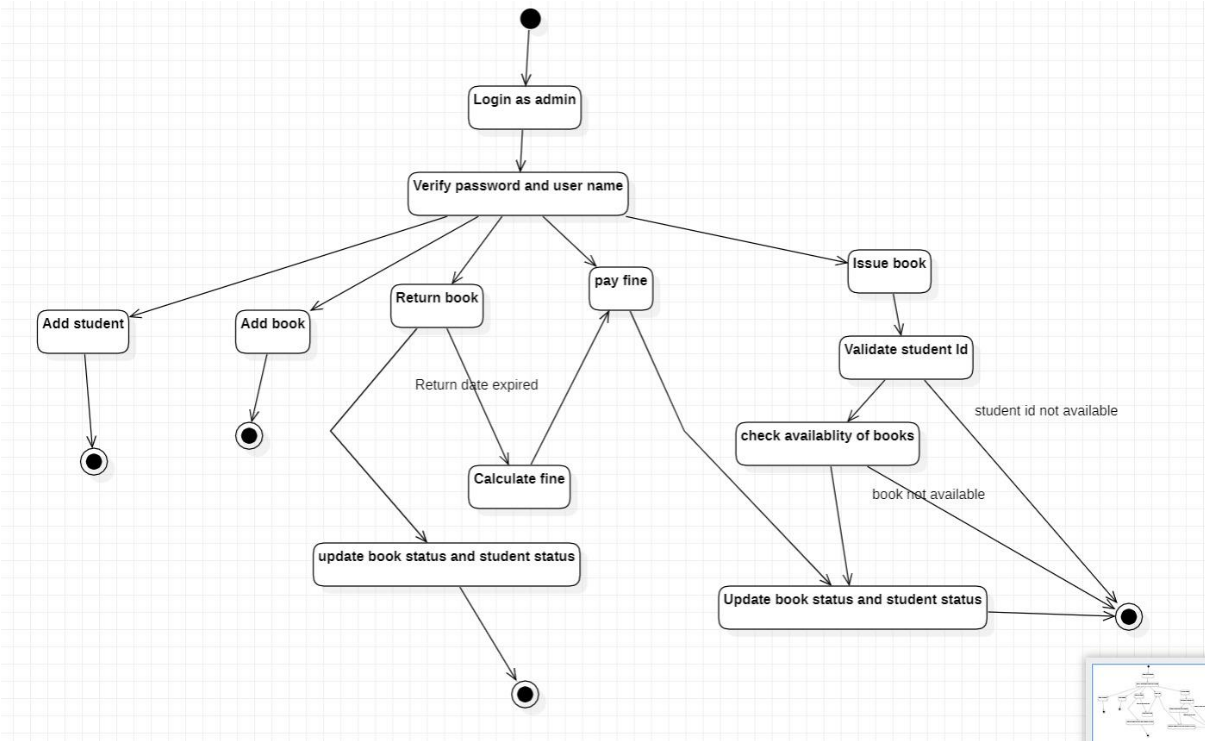
CLASS DIAGRAM:



ACTIVITY DIAGRAM:



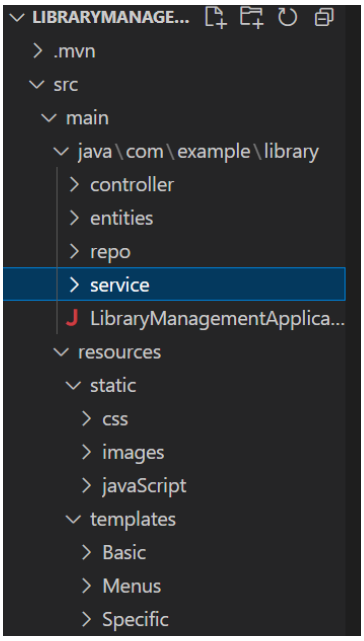
STATE DIAGRAM:



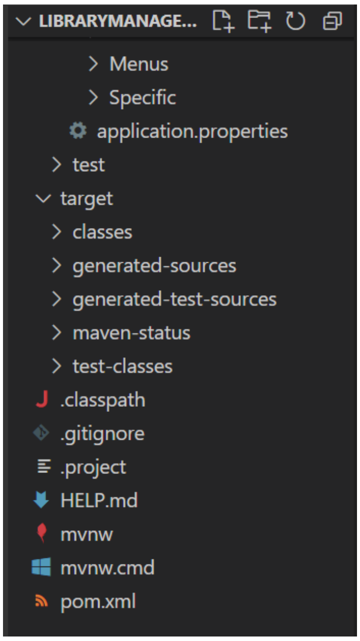
MODEL – VIEW – CONTROLLER ARCHITECTURE:

The Model View Controller (MVC) design pattern specifies that an application consist of a data model, presentation information, and control information. The pattern requires that each of these be separated into different objects. MVC is more of an architectural pattern, but not for complete application. MVC mostly relates to the UI / interaction layer of an application. You're still going to need business logic layer, maybe some service layer and data access layer.

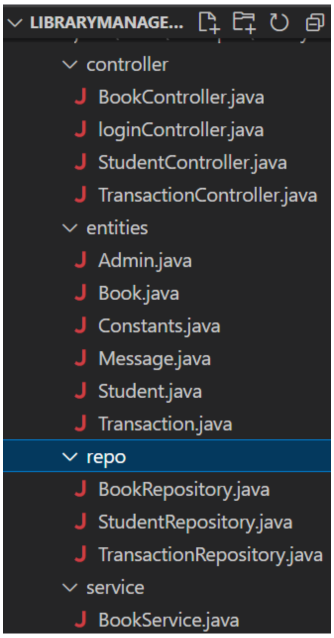
- The **Model** contains only the pure application data, it contains no logic describing how to present the data to a user. (Its just a data that is shipped across the application like for example from back-end server view and from front-end view to the database. In java programming, Model can be represented by the use of POJO (Plain-old-java-object) which is a simple java class.
- The **View** presents the model's data to the user. The view knows how to access the model's data, but it does not know what this data means or what the user can do to manipulate it. View just represent, displays the application's data on screen. View page are generally in the format of .html or .jsp in java programming (which is flexible).
- The **Controller** exists between the view and the model. It is where the actual business logic is written. It listens to events triggered by the view (or another external source) and executes the appropriate reaction to these events. In most cases, the reaction is to call a method on the model. Since the view and the model are connected through a notification mechanism, the result of this action is then automatically reflected in the view.



```
LIBRARYMANAGE...
  > .mvn
  v src
    v main
      v java \ com \ example \ library
        > controller
        > entities
        > repo
        > service
        LibraryManagementApplica...
      v resources
        v static
          > css
          > images
          > javaScript
        v templates
          > Basic
          > Menus
          > Specific
```



```
LIBRARYMANAGE...
          > Menus
          > Specific
        application.properties
    > test
  v target
    > classes
    > generated-sources
    > generated-test-sources
    > maven-status
    > test-classes
  .classpath
  .gitignore
  .project
  HELP.md
  mvnw
  mvnw.cmd
  pom.xml
```



```
LIBRARYMANAGE...
  v controller
    BookController.java
    loginController.java
    StudentController.java
    TransactionController.java
  v entities
    Admin.java
    Book.java
    Constants.java
    Message.java
    Student.java
    Transaction.java
  v repo
    BookRepository.java
    StudentRepository.java
    TransactionRepository.java
  v service
    BookService.java
```

DESIGN PRINCIPLES:

The following principles have been used in our project:

- **S - Single Responsibility Principle**:

This principle has been used in the creation of Admin functionality and Books functionalities.

- **O - Open Closed Principle:**

This principle Is used in the implementation of specifying features of the controller part of our project (BookController.java, loginController.java, StudentController.java, TransactionController.java)

- **I - Interface Segregation:**

This principle has been used to segregate the interface functionalities of different use cases in our project.

- **D - Dependency Inversion:**

This principle has been used to implement to remove complexity of high level modules, that do not depend the lower level modules.

Design Patterns:

1. Singleton Design Pattern:

Singleton pattern is one of the simplest design patterns in Java. This type of design pattern comes under creational pattern as this pattern provides one of the best ways to create an object. This pattern involves a single class which is responsible to create an object while making sure that only single object gets created. This class provides a way to access its only object which can be accessed directly without need to instantiate the object of the class.

In our project all the functionalities of the Book implantation like adding a book, issuing a book, tracking a book, fine payment have all been implementing by using this design pattern.

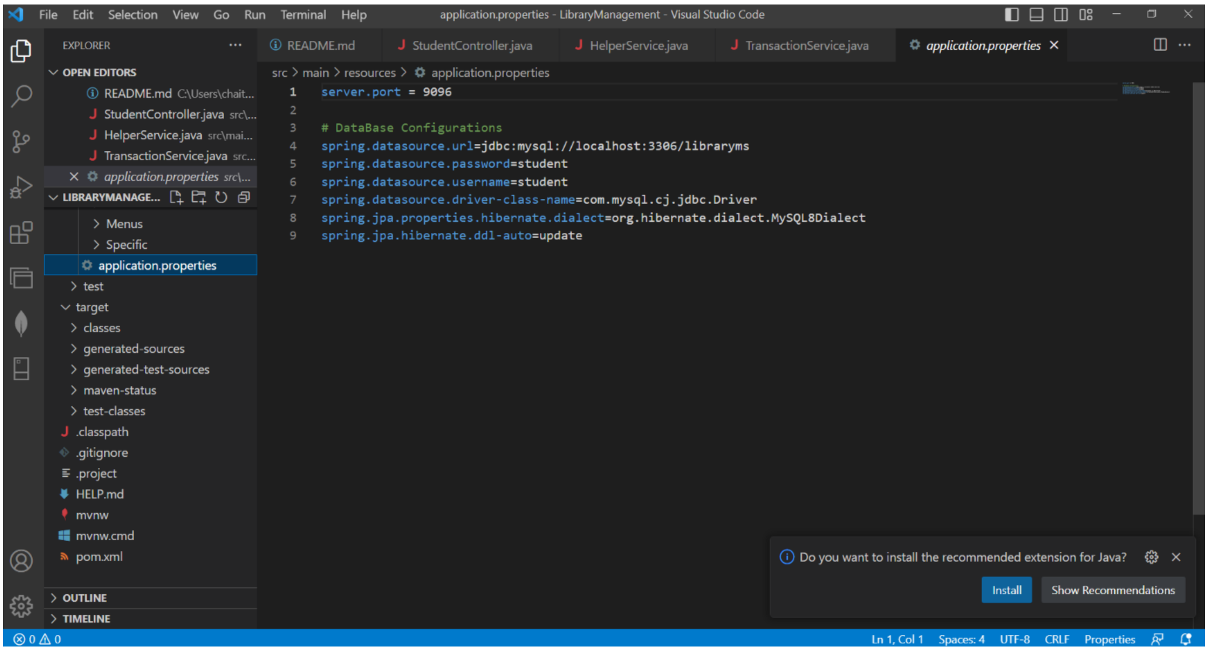
2. Service Layer Pattern:

Service Layer is an abstraction over domain logic. It defines application's boundary with a layer of services that establishes a set of available operations and coordinates the application's response in each operation. In our project this patter is defined in the classifying the services that a user needs, hence mapping the each service to a particular user request.

Implemented in (StudentService.java, TransactionService.java,BookService.java,HelpService.java)

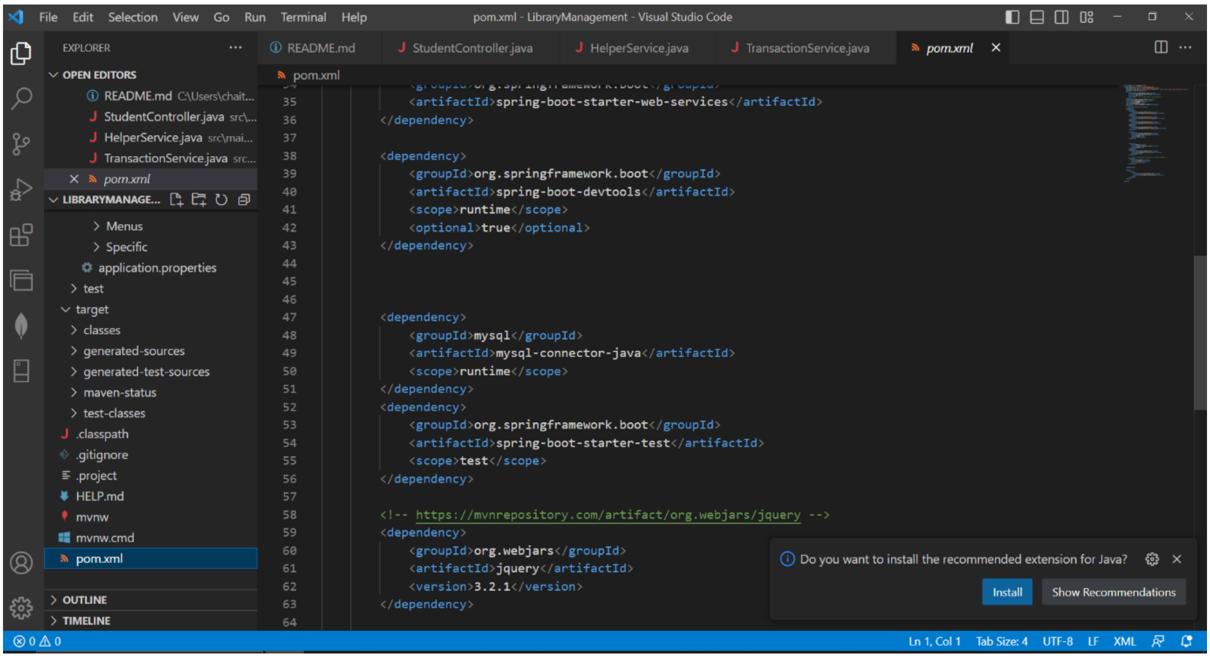
Database:

We have used MySql Database, to make our project data persistent, along with the implementation of Spring MVC Framework.



```
server.port = 9096

# DataBase Configurations
spring.datasource.url=jdbc:mysql://localhost:3306/libraryms
spring.datasource.password=student
spring.datasource.username=student
spring.datasource.driver-class-name=com.mysql.cj.jdbc.Driver
spring.jpa.properties.hibernate.dialect=org.hibernate.dialect.MySQL8Dialect
spring.jpa.hibernate.ddl-auto=update
```

Do you want to install the recommended extension for Java?

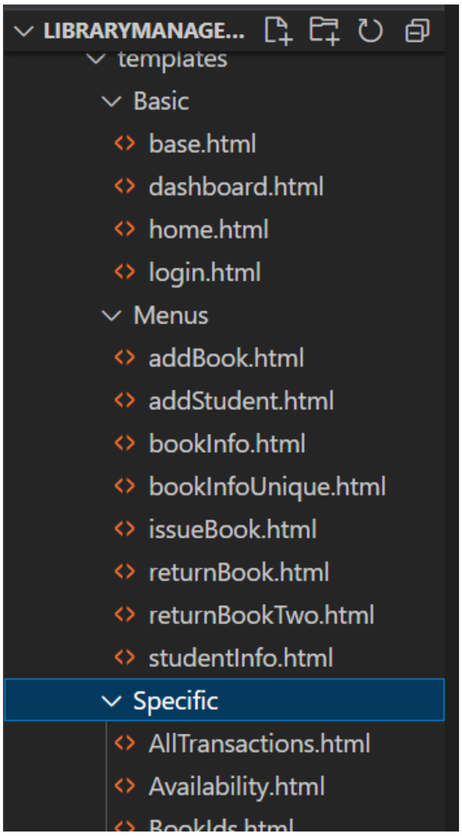


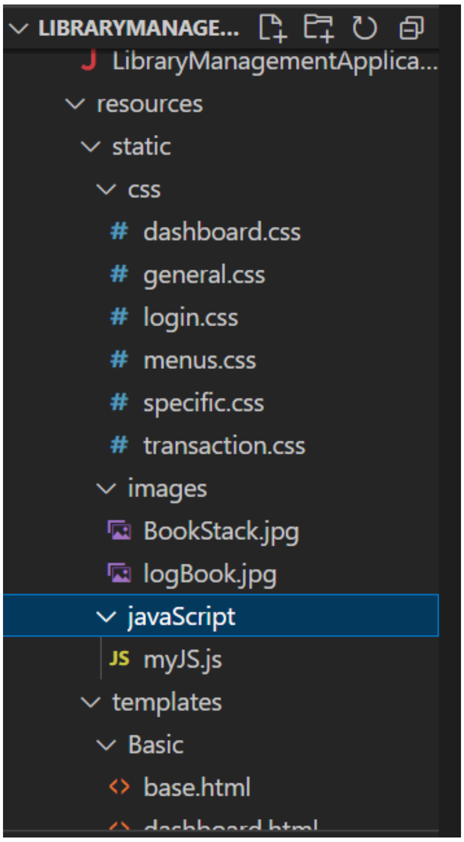
```xml
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-web-services</artifactId>
        </dependency>

        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-devtools</artifactId>
            <scope>runtime</scope>
            <optional>true</optional>
        </dependency>



        <dependency>
            <groupId>mysql</groupId>
            <artifactId>mysql-connector-java</artifactId>
            <scope>runtime</scope>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-test</artifactId>
            <scope>test</scope>
        </dependency>

        <!-- https://mvnrepository.com/artifact/org.webjars/jquery -->
        <dependency>
            <groupId>org.webjars</groupId>
            <artifactId>jquery</artifactId>
            <version>3.2.1</version>
        </dependency>
```

Do you want to install the recommended extension for Java?

Front End:

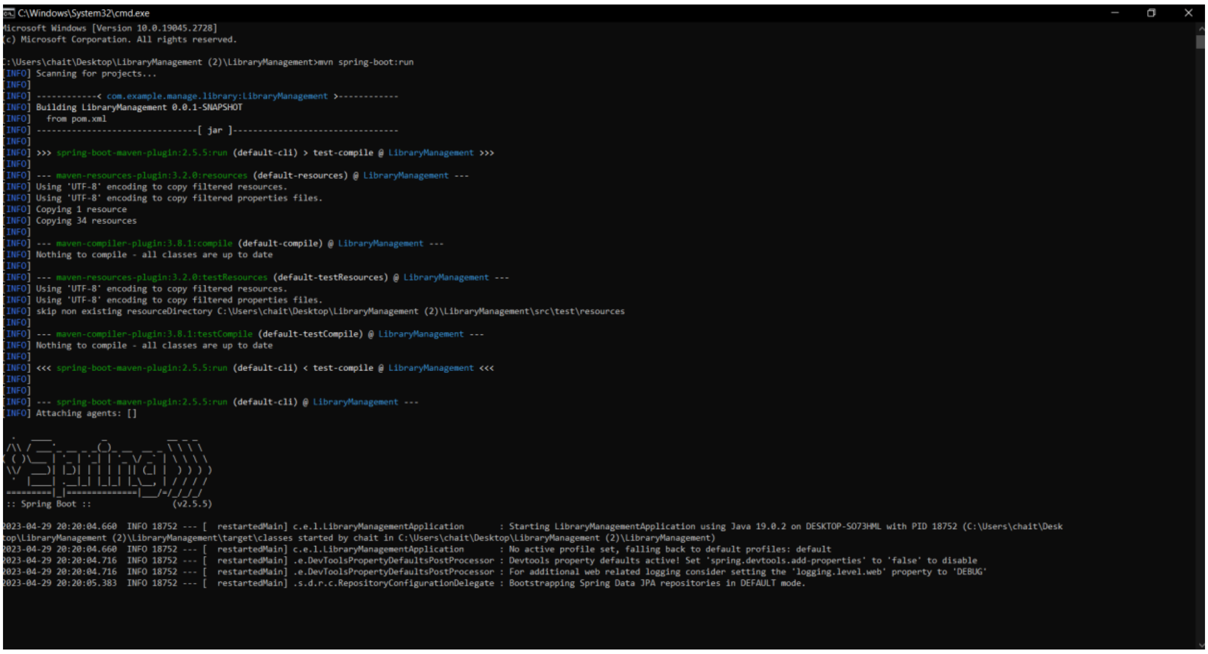
HTML and CSS have been used to implement a user-friendly front end.





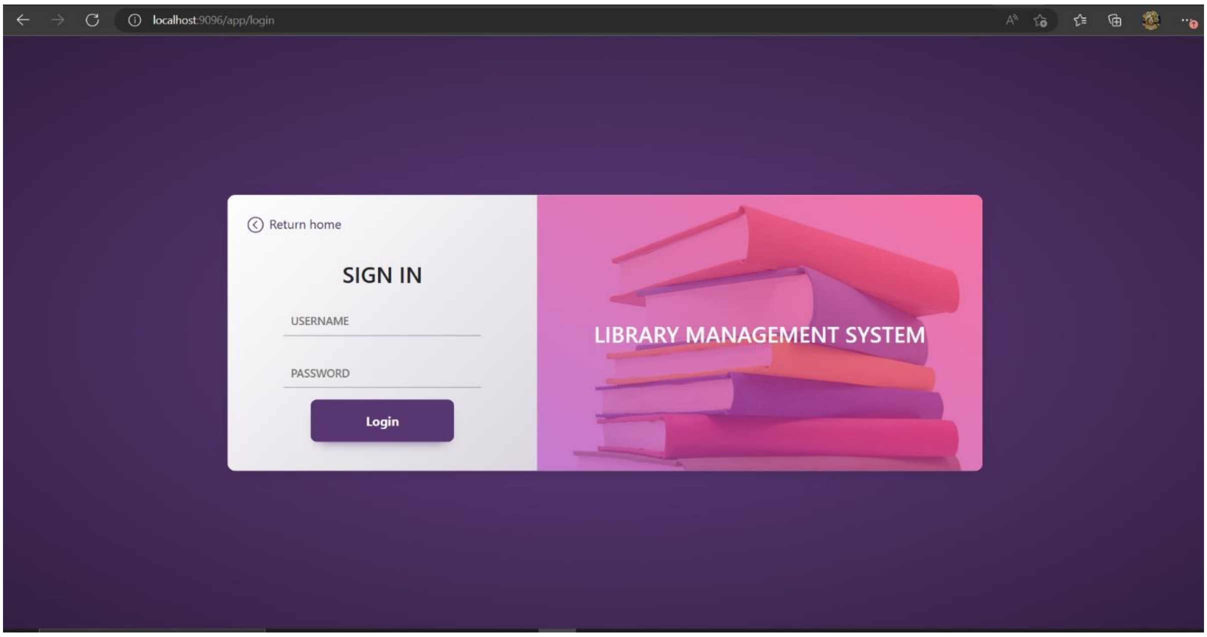
Project Screenshots:

- Starting MCV using Spring Maven

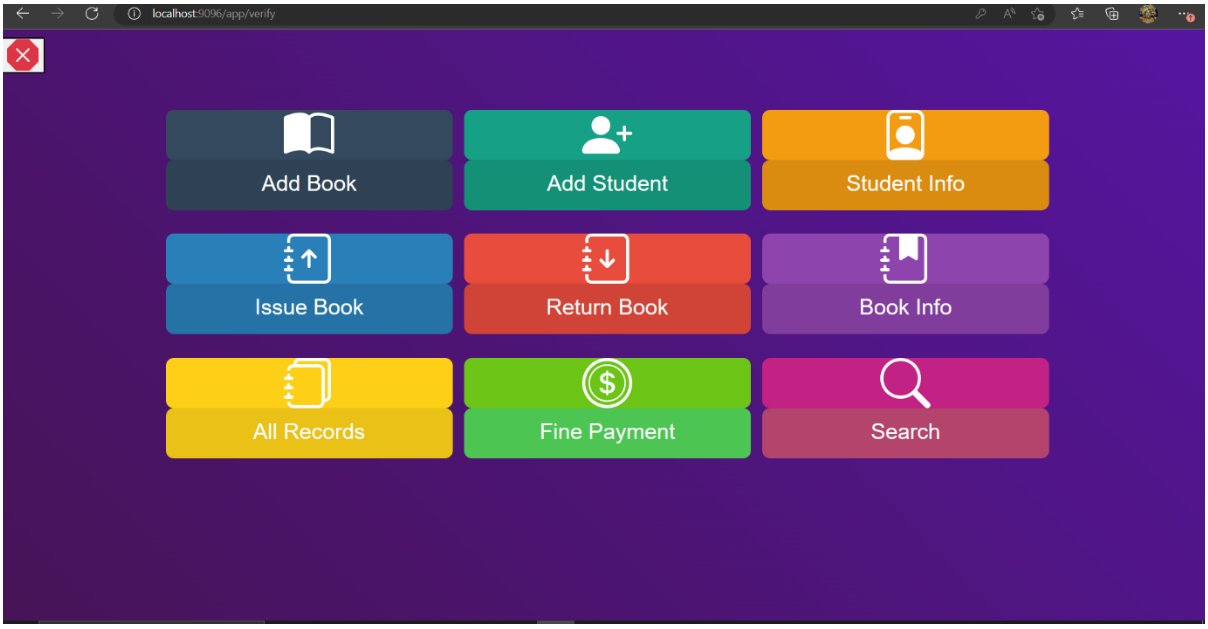


```
C:\Windows\System32\cmd.exe
icrosoft Windows [Version 10.0.19045.2728]
(c) Microsoft Corporation. All rights reserved.

:\Users\chait\Desktop\LibraryManagement (2)\LibraryManagement>mvn spring-boot:run
[INFO] Scanning for projects...
[INFO]
[INFO] ------------< com.example.manage.library:LibraryManagement >------------
[INFO] Building LibraryManagement 0.0.1-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] >>> spring-boot-maven-plugin:2.5.5:run (default-cli) > test-compile @ LibraryManagement >>>
[INFO]
[INFO] --- maven-resources-plugin:3.2.0:resources (default-resources) @ LibraryManagement ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] Using 'UTF-8' encoding to copy filtered properties files.
[INFO] Copying 1 resource
[INFO] Copying 34 resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.1:compile (default-compile) @ LibraryManagement ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-resources-plugin:3.2.0:testResources (default-testResources) @ LibraryManagement ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] Using 'UTF-8' encoding to copy filtered properties files.
[INFO] skip non existing resourceDirectory C:\Users\chait\Desktop\LibraryManagement (2)\LibraryManagement\src\test\resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.1:testCompile (default-testCompile) @ LibraryManagement ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] <<< spring-boot-maven-plugin:2.5.5:run (default-cli) < test-compile @ LibraryManagement <<<
[INFO]
[INFO]
[INFO] --- spring-boot-maven-plugin:2.5.5:run (default-cli) @ LibraryManagement ---
[INFO] Attaching agents: []

  .   ____          _            __ _ _
 /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::                (v2.5.5)

023-04-29 20:20:04.660  INFO 18752 --- [  restartedMain] c.e.l.LibraryManagementApplication       : Starting LibraryManagementApplication using Java 19.0.2 on DESKTOP-SO73HML with PID 18752 (C:\Users\chait\Desk
top\LibraryManagement (2)\LibraryManagement\target\classes started by chait in C:\Users\chait\Desktop\LibraryManagement (2)\LibraryManagement)
023-04-29 20:20:04.660  INFO 18752 --- [  restartedMain] c.e.l.LibraryManagementApplication       : No active profile set, falling back to default profiles: default
023-04-29 20:20:04.716  INFO 18752 --- [  restartedMain] .e.DevToolsPropertyDefaultsPostProcessor : Devtools property defaults active! Set 'spring.devtools.add-properties' to 'false' to disable
023-04-29 20:20:04.716  INFO 18752 --- [  restartedMain] .e.DevToolsPropertyDefaultsPostProcessor : For additional web related logging consider setting the 'logging.level.web' property to 'DEBUG'
023-04-29 20:20:05.383  INFO 18752 --- [  restartedMain] .s.d.r.c.RepositoryConfigurationDelegate : Bootstrapping Spring Data JPA repositories in DEFAULT mode.
```

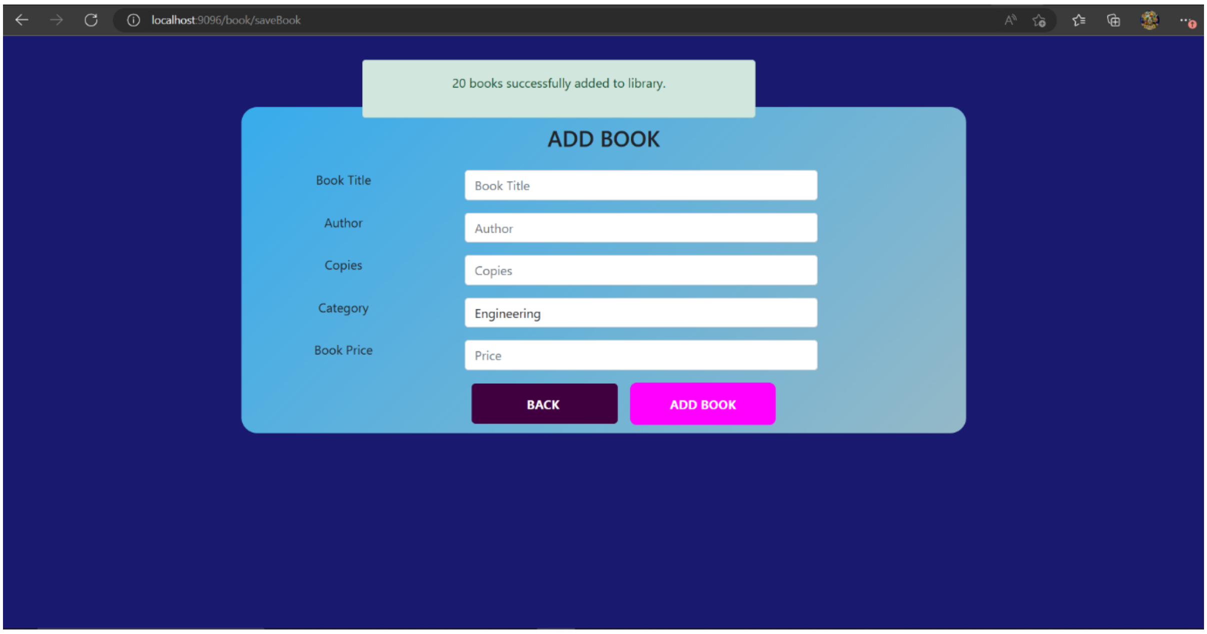
- **Login Page**



- **Admin Dashboard**



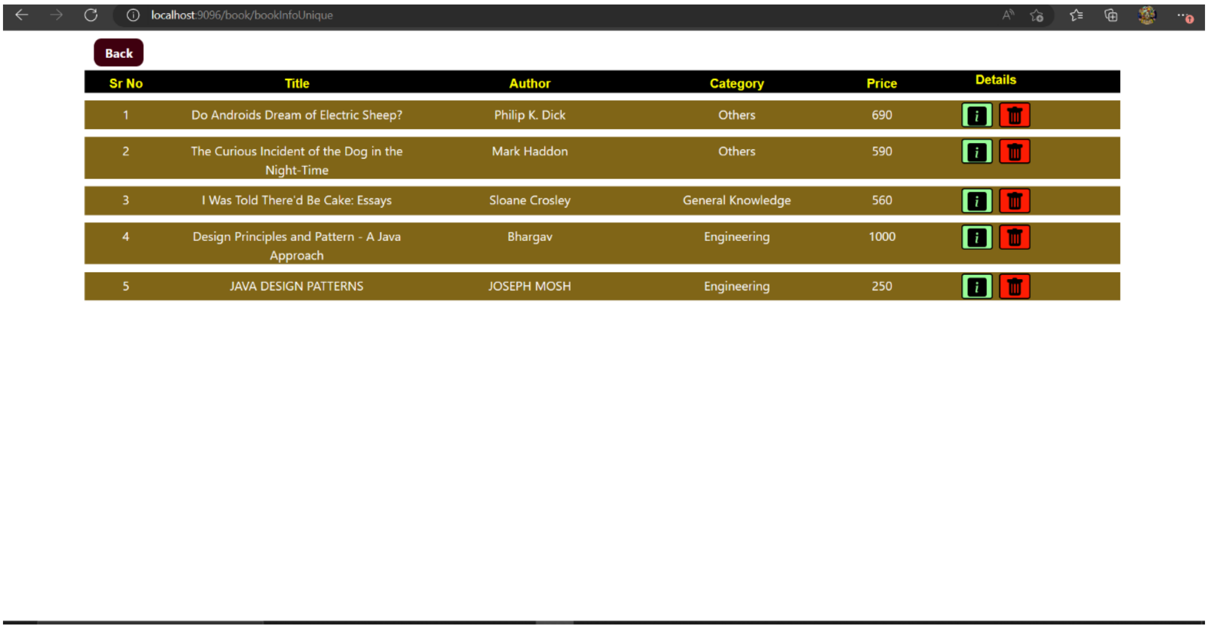
- **Adding Books**


20 books successfully added to library.

ADD BOOK

Book Title	Book Title
Author	Author
Copies	Copies
Category	Engineering
Book Price	Price

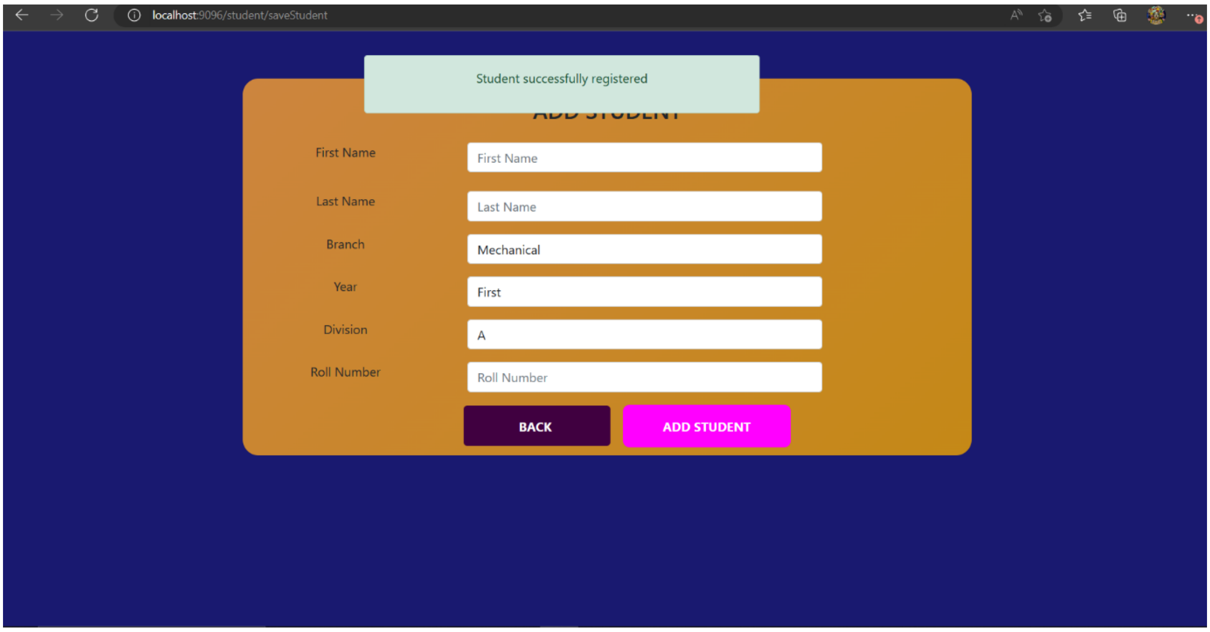
- ## Book Info:



localhost:9096/book/bookInfoUnique

Sr No	Title	Author	Category	Price	Details
1	Do Androids Dream of Electric Sheep?	Philip K. Dick	Others	690	ℹ 🗑
2	The Curious Incident of the Dog in the Night-Time	Mark Haddon	Others	590	ℹ 🗑
3	I Was Told There'd Be Cake: Essays	Sloane Crosley	General Knowledge	560	ℹ 🗑
4	Design Principles and Pattern - A Java Approach	Bhargav	Engineering	1000	ℹ 🗑
5	JAVA DESIGN PATTERNS	JOSEPH MOSH	Engineering	250	ℹ 🗑

- ## ADD STUDENT

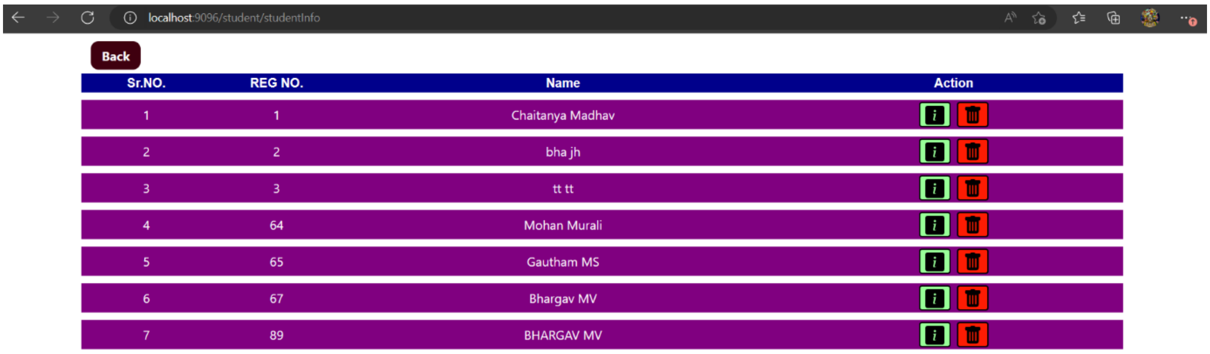


localhost:9096/student/saveStudent

Student successfully registered

First Name	First Name
Last Name	Last Name
Branch	Mechanical
Year	First
Division	A
Roll Number	Roll Number

- **STUDENT INFO**

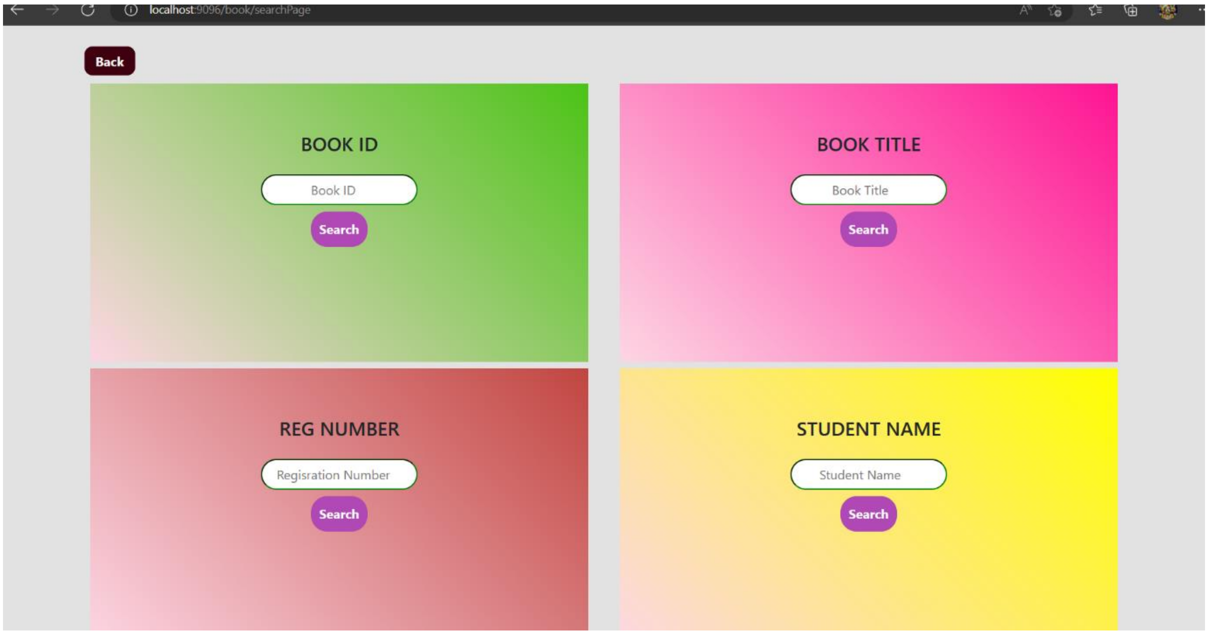


localhost:9096/student/studentInfo

Back

Sr.NO.	REG NO.	Name	Action
1	1	Chaitanya Madhav	i 🗑
2	2	bha jh	i 🗑
3	3	tt tt	i 🗑
4	64	Mohan Murali	i 🗑
5	65	Gautham MS	i 🗑
6	67	Bhargav MV	i 🗑
7	89	BHARGAV MV	i 🗑

- **Searching a book from User Account:**



localhost:9096/book/searchPage

Back

BOOK ID

Book ID

Search

BOOK TITLE

Book Title

Search

REG NUMBER

Regisration Number

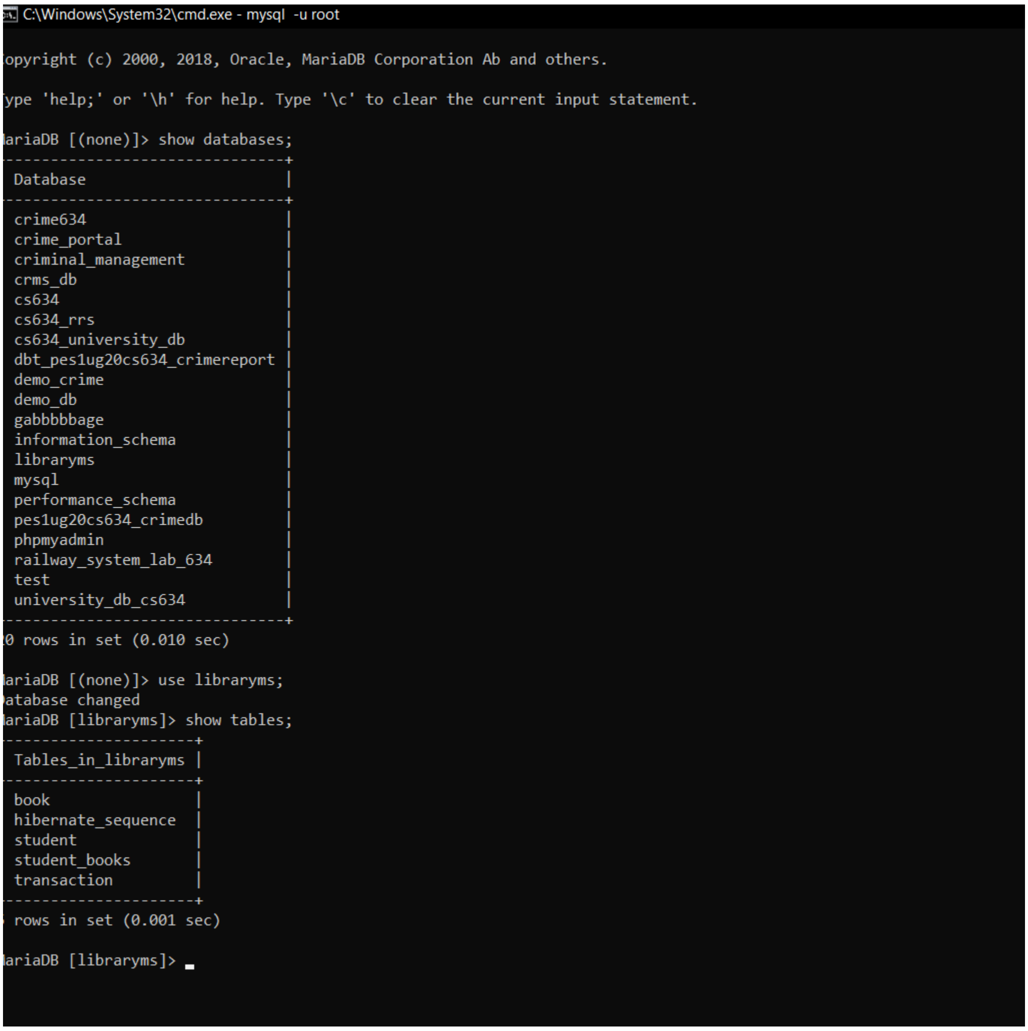
Search

STUDENT NAME

Student Name

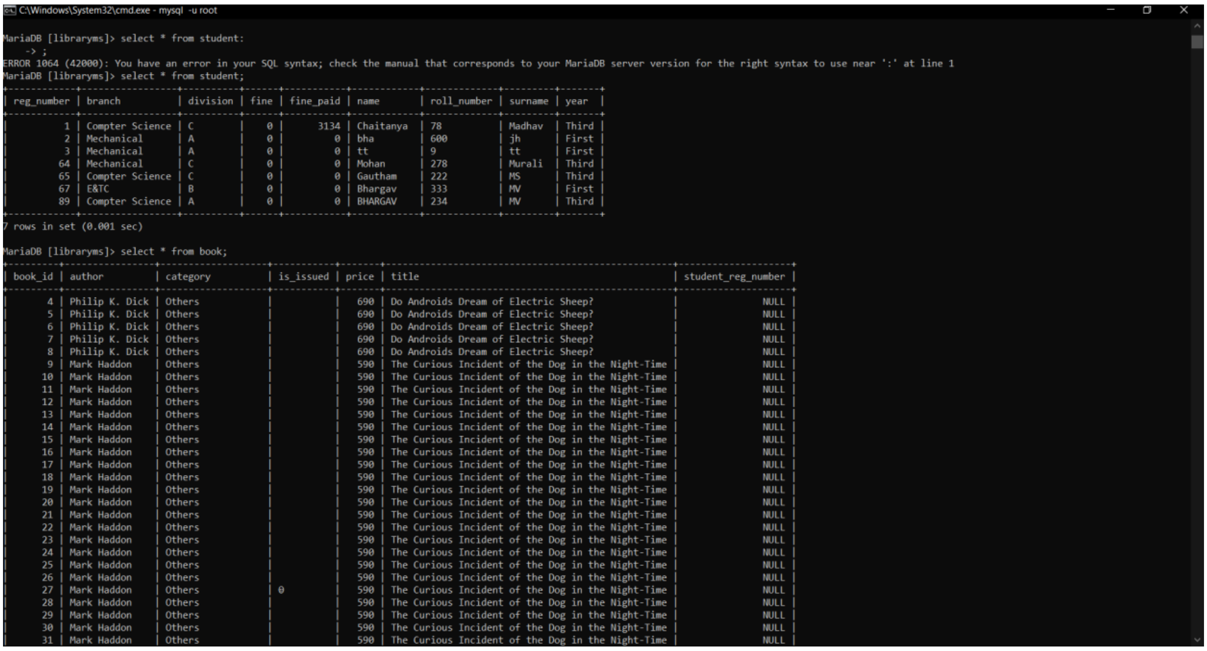
Search

- **Back End MySQL**:



C:\Windows\System32\cmd.exe - mysql -u root

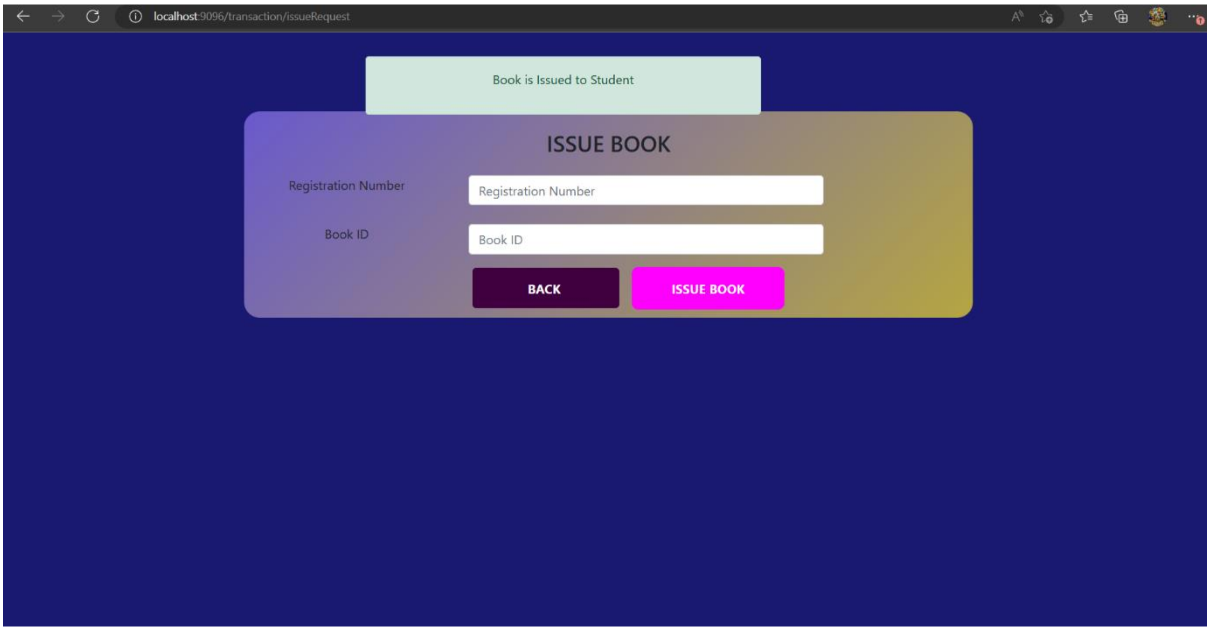
```
opyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

ype 'help;' or '\h' for help. Type '\c' to clear the current input statement.

ariaDB [(none)]> show databases;
-------------------------------+
 Database                      |
-------------------------------+
 crime634                      |
 crime_portal                  |
 criminal_management           |
 crms_db                       |
 cs634                         |
 cs634_rrs                     |
 cs634_university_db           |
 dbt_pes1ug20cs634_crimereport |
 demo_crime                    |
 demo_db                       |
 gabbbbbage                    |
 information_schema            |
 libraryms                     |
 mysql                         |
 performance_schema            |
 pes1ug20cs634_crimedb         |
 phpmyadmin                    |
 railway_system_lab_634        |
 test                          |
 university_db_cs634           |
-------------------------------+
0 rows in set (0.010 sec)

ariaDB [(none)]> use libraryms;
atabase changed
ariaDB [libraryms]> show tables;
--------------------+
 Tables_in_libraryms |
--------------------+
 book                |
 hibernate_sequence  |
 student             |
 student_books       |
 transaction         |
--------------------+
 rows in set (0.001 sec)

ariaDB [libraryms]> _
```



C:\Windows\System32\cmd.exe - mysql -u root

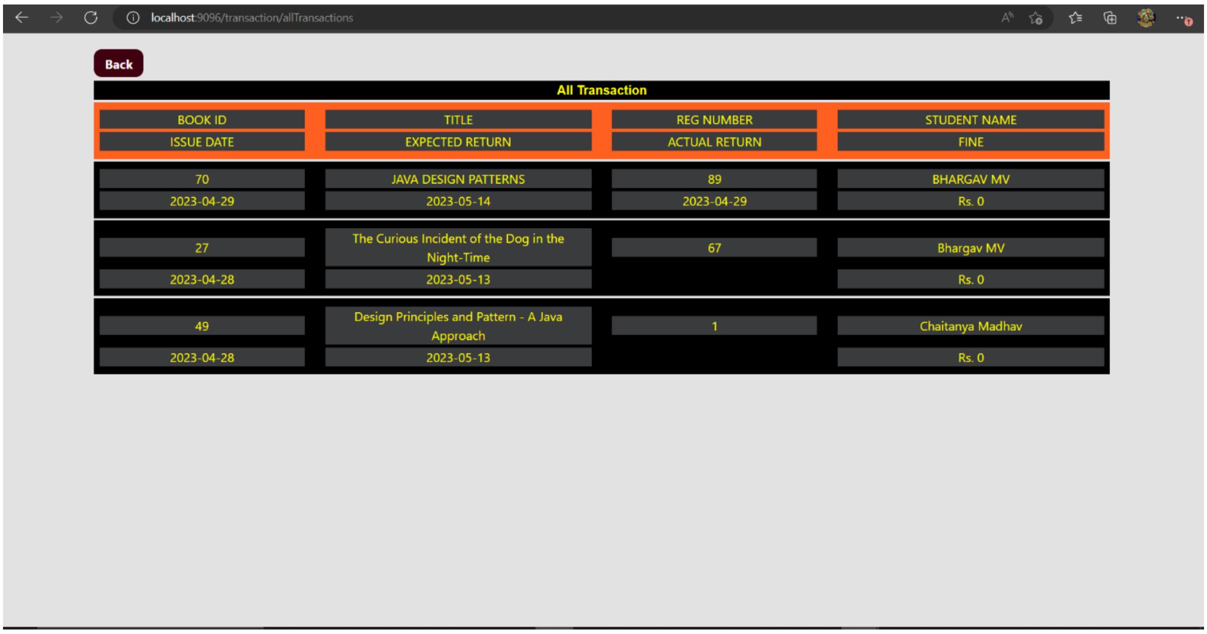
```
MariaDB [libraryms]> select * from student:
    -> ;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB server version for the right syntax to use near ':' at line 1
MariaDB [libraryms]> select * from student;
+------------+-----------------+----------+------+-----------+-----------+-------------+---------+-------+
| reg_number | branch          | division | fine | fine_paid | name      | roll_number | surname | year  |
+------------+-----------------+----------+------+-----------+-----------+-------------+---------+-------+
|          1 | Compter Science | C        |    0 |      3134 | Chaitanya | 78          | Madhav  | Third |
|          2 | Mechanical      | A        |    0 |         0 | bha       | 600         | jh      | First |
|          3 | Mechanical      | A        |    0 |         0 | tt        | 9           | tt      | First |
|         64 | Mechanical      | C        |    0 |         0 | Mohan     | 278         | Murali  | Third |
|         65 | Compter Science | C        |    0 |         0 | Gautham   | 222         | MS      | Third |
|         67 | E&TC            | B        |    0 |         0 | Bhargav   | 333         | MV      | First |
|         89 | Compter Science | A        |    0 |         0 | BHARGAV   | 234         | MV      | Third |
+------------+-----------------+----------+------+-----------+-----------+-------------+---------+-------+
7 rows in set (0.001 sec)

MariaDB [libraryms]> select * from book;
+---------+----------------+--------------------+-----------+-------+---------------------------------------------------+--------------------+
| book_id | author         | category           | is_issued | price | title                                             | student_reg_number |
+---------+----------------+--------------------+-----------+-------+---------------------------------------------------+--------------------+
|       4 | Philip K. Dick | Others             |           |   690 | Do Androids Dream of Electric Sheep?              |               NULL |
|       5 | Philip K. Dick | Others             |           |   690 | Do Androids Dream of Electric Sheep?              |               NULL |
|       6 | Philip K. Dick | Others             |           |   690 | Do Androids Dream of Electric Sheep?              |               NULL |
|       7 | Philip K. Dick | Others             |           |   690 | Do Androids Dream of Electric Sheep?              |               NULL |
|       8 | Philip K. Dick | Others             |           |   690 | Do Androids Dream of Electric Sheep?              |               NULL |
|       9 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      10 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      11 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      12 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      13 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      14 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      15 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      16 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      17 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      18 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      19 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      20 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      21 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      22 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      23 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      24 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      25 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      26 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      27 | Mark Haddon    | Others             | 0         |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      28 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      29 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      30 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
|      31 | Mark Haddon    | Others             |           |   590 | The Curious Incident of the Dog in the Night-Time |               NULL |
```

- **Issue Book:**



Book is Issued to Student

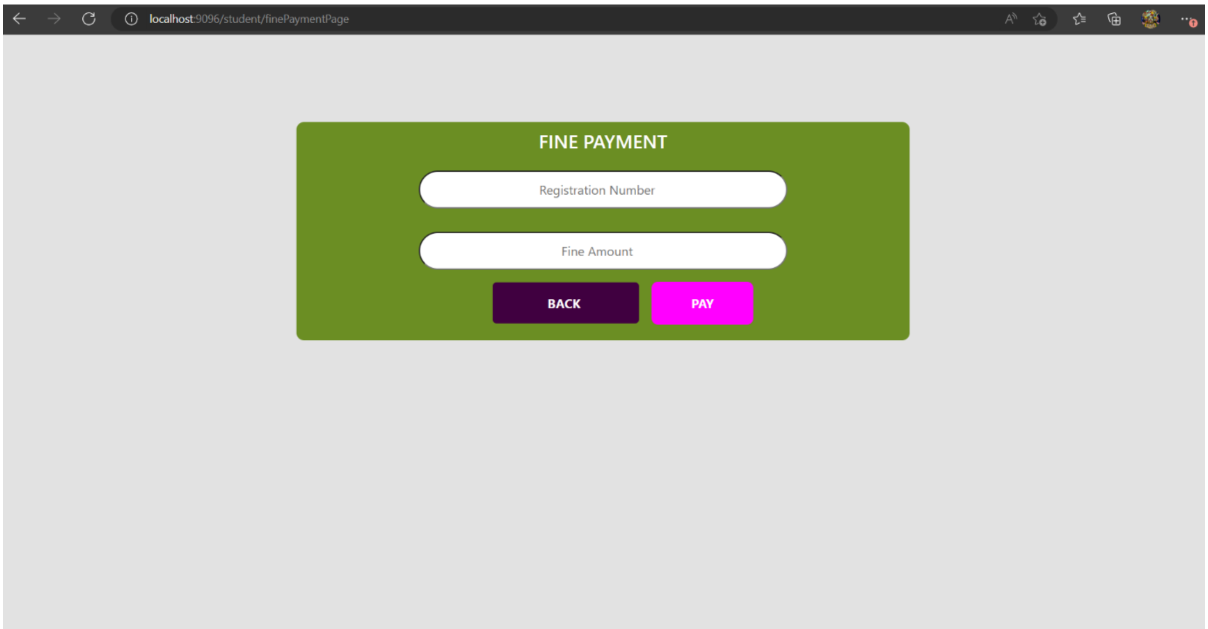
- **ALL Transactions List:**



All Transaction

BOOK ID	TITLE	REG NUMBER	STUDENT NAME
ISSUE DATE	EXPECTED RETURN	ACTUAL RETURN	FINE
70	JAVA DESIGN PATTERNS	89	BHARGAV MV
2023-04-29	2023-05-14	2023-04-29	Rs. 0
27	The Curious Incident of the Dog in the Night-Time	67	Bhargav MV
2023-04-28	2023-05-13		Rs. 0
49	Design Principles and Pattern - A Java Approach	1	Chaitanya Madhav
2023-04-28	2023-05-13		Rs. 0

- **Fine Payment:**



localhost:9096/student/finePaymentPage

FINE PAYMENT