Programming for Software Engineers

Weekend Fitness Club Booking System

Student Name: Hari Srinivasa Raju Chitraju

**Student ID: 21089179**

Table of Contents

Introduction

The Weekend Fitness Club Booking System is a software solution designed to manage bookings made by customers for different types of fitness lessons. The system offers customers two ways to view the timetable, either by day or by fitness type. Customers can book as many lessons as they want, and they are allowed to change or cancel a booking before the lesson date. After each group fitness lesson, customers can rate and review the lesson they have attended. The system also generates two reports: a report containing the number of customers per lesson on each day, along with the average rating of each lesson, and a report containing the type of fitness lessons which has generated the highest income.

UML Class Diagram
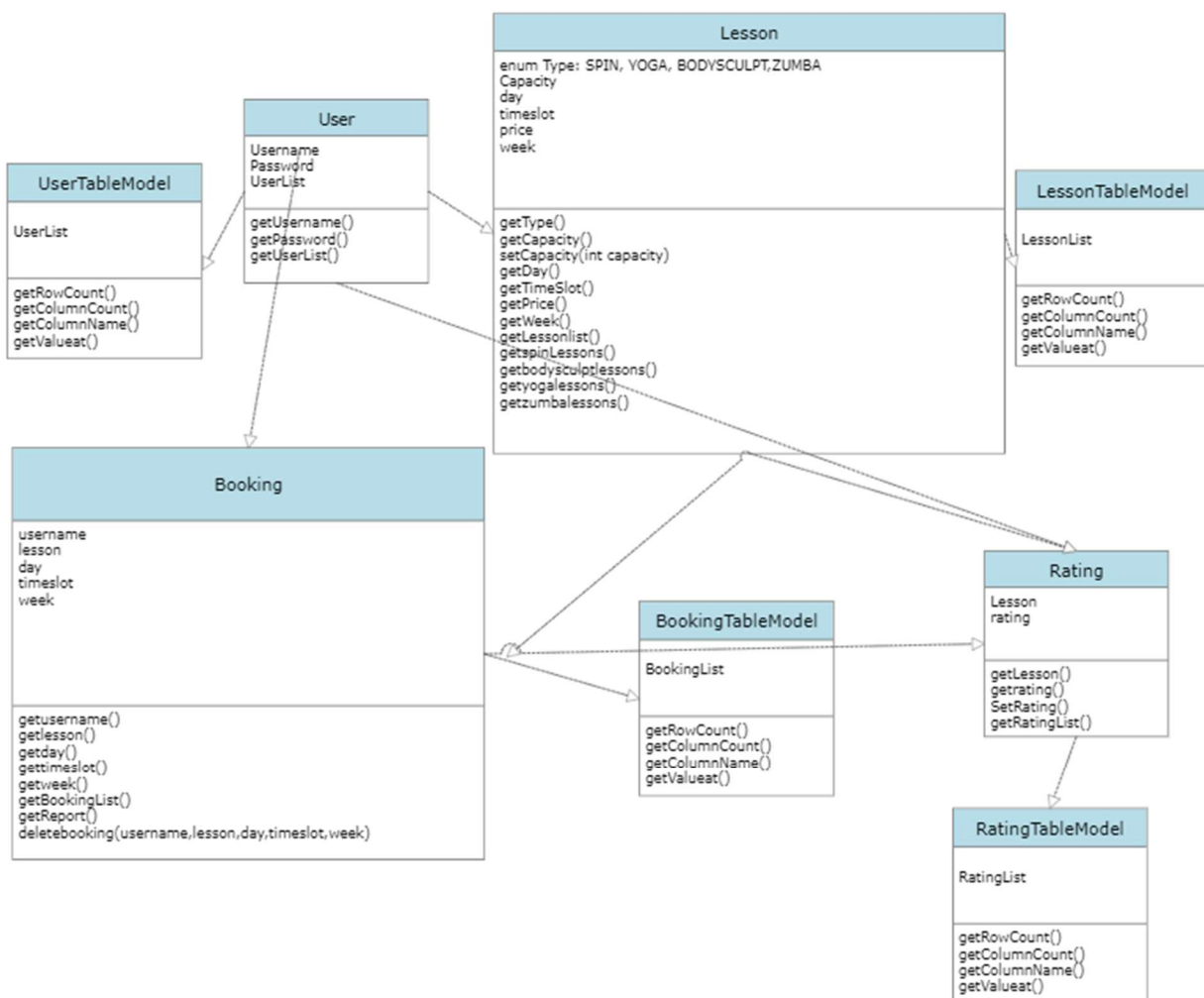
UML DIAGRAM:
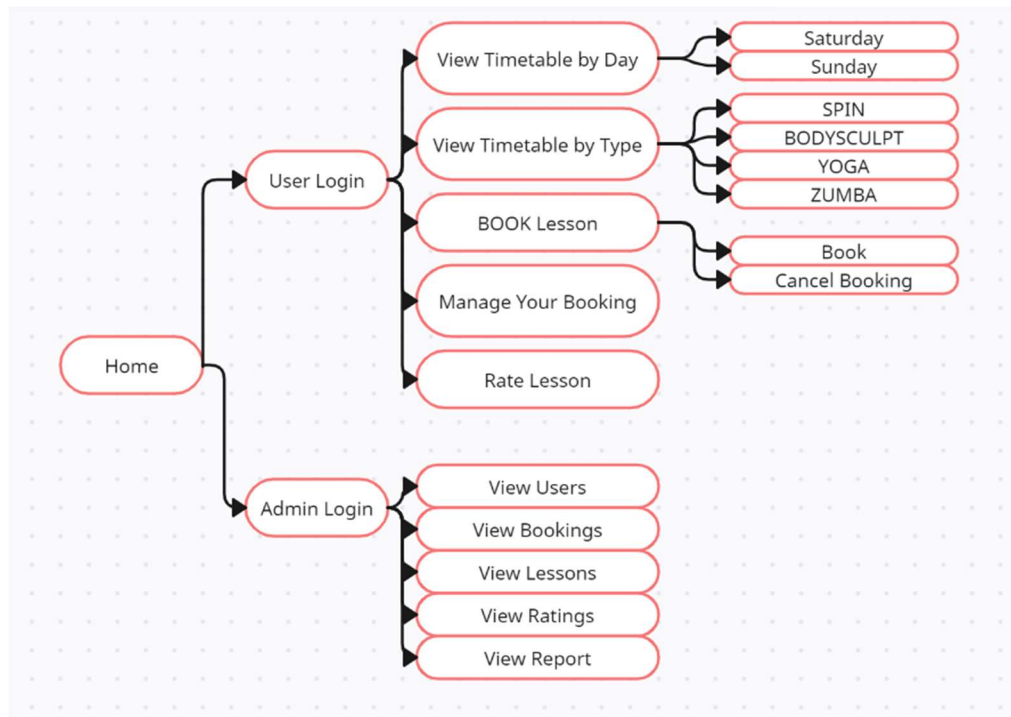
Overall Structure and Design:

The Weekend Fitness Club Booking System has been designed with a layered architecture, consisting of three main layers: Presentation, Business, and Data Access. The Presentation layer is responsible for interacting with the user, displaying the timetable and receiving user input. The Business layer contains the business logic and is responsible for managing the bookings, lessons, and ratings. The Data Access layer provides access to the List and ArrayList and is responsible for storing and retrieving data.

Use of Version, with Suitable Commit Messages

Version 1.0: Sports Booking System

The Weekend Fitness Club (WFC) requires a software system to control reservations and client feedback for its group fitness classes. The club's group fitness courses will be scheduled using this software programme, which is called the Sports Booking System, on both Saturdays and Sundays (Macias et al., 2020). Customers can browse the schedule either by day or by type of fitness session using the Sports Booking System, and they can schedule lessons in accordance with the schedule. Customers may also modify their reservations, assuming that there is still room in the newly chosen lesson. Customers can also change or cancel their reservations before to the lesson, as well as leave reviews and rate the lesson they have attended.

Two reports must also be produced by the software system. The initial report will include the average rating for each lesson as well as the number of students per lesson on each day. The second report will feature the fitness lesson type that brought in the most money overall, counting all similar lesson kinds.

Version 1.1: Timetable Creation

The Sports Booking System has been updated with the ability to create timetables for the club's group fitness lessons. The timetables will include at least 8 weekends of lessons (32 lessons in total), covering at least 4 different types of fitness lessons (Devroey, Panichella and Gambi, 2020).

Version 1.2: Customer Registration

Customers can now register with the Sports Booking System thanks to an update. Customers will be able to do this in order to examine the schedule, schedule lessons, modify or cancel existing reservations, write reviews, and give ratings. The customer registration feature will also ensure that the system can keep track of the number of customers per lesson on each day, as well as the average rating for each lesson. This will be used to generate the two reports mentioned in the previous version.

Assumptions:
- The customer information is pre-registered in the system.
- The system will not be accessed by unauthorized users.
- Customers will only book lessons for the next 4 weeks (i.e., 8 weekends).
- Each lesson can accommodate a maximum of 5 customers.
- All the same types of lessons have the same price.
- Customers can only provide one rating and review per attended lesson.
- The system will be used for one location only.
- The system will not be integrated with any external databases and thus List and ArrayList will be used

Classes:
The system is composed of several classes, each with a specific responsibility. The main classes are:

- **User**: Represents all the Users in the Weekend Fitness Club. It stores Username and Password of the Users and Also Prepare a List of username and password to store them.
- **Lesson**: Represents all the lessons in the Weekend Fitness Club. It stores Lesson Type, Capacity, Day, Time Slot, Price and Week in a list lesson and can be called through different methods Such as getLessonList or GetSPINLessonList(return the LessonList which only has Spin Lesson in its type). And including it many more methods are defined.
- **Rating**: Represents the Ratings for the Lesson in the Weekend Fitness Club. It stores Lesson Type and Rating in a list. And Because of this user can provide rating to a Lesson and that will be stored in the list.
- **Booking**: Represents the Booking done by the User. It stores Username from User Class and Lesson Type, day, time slot, week From Lesson Class. It includes method to create a booking and once the method is called, it would check if that lesson type has capacity or not . If it has it will Store the Booking data in a list (bookinglist) and provide a message of Booking Success. And If it had no capacity, then it will return the message of Unsuccessful Booking due to capacity full.

Design Patterns and Principles:

The Weekend Fitness Club Booking System uses several design patterns and principles to achieve modularity, maintainability, and scalability. Some of the patterns and principles used are:

- **Model-View-Controller (MVC) pattern**: The system separates the presentation layer from the business and data access layers, allowing for better modularity and maintainability.
- **Single Responsibility Principle (SRP)**: Each class in the system has a single responsibility and is responsible for one aspect of the system's functionality.
- **Open-Closed Principle (OCP)**: The system is designed to be open for extension but closed for modification, allowing for new features to be added without modifying existing code.

Implementation of System

Customers can choose and book group exercise classes for either Saturday or Sunday. Among the fitness classes offered are SPIN, YOGA, BODYSCULPT, ZUMBA, and others. At most five students can participate in one lesson. Customers have the option of viewing the schedule by day or by fitness level. As long as there are still spots available for the newly chosen lesson, they can also modify their bookings. Customers can post reviews and score the lesson on a scale of 1 to 5, with 1 representing the least satisfaction and 5 representing the highest satisfaction, after taking the class (Mukherjee and K. Sridhar Patnaik, 2019).

The Sports Booking System has the ability to provide reports as well. It prints a report with the average lesson rating and the number of customers per lesson for each day. Additionally, a report highlighting the fitness lesson category that brought in the most money is printed, grouping all lessons of the same category together for the timetable's layout.

It offers 4 different types of fitness lessons throughout the course of at least 8 weekends (i.e., 32 lessons). Additionally, it enables clients to pre-register or to be added to the system. An effective and dependable piece of software called Sports Booking System was created to handle reservations for the Weekend Fitness Club (WFC). It streamlines the reservation process and makes it simple for customers to make, modify, and cancel reservations. Additionally, it offers information to help

the WFC keep tabs on the number of clients per lesson and the kinds of fitness classes that have brought in the most money.

Structure and Design of Program

The Weekend Fitness Club's (WFC) bookings are managed by a piece of software called the Sports Booking System. Customers can use the system to view the schedule for fitness classes by kind or day. If there are still openings for the newly chosen lesson, customers may book as many lessons as they'd like. Customers may also modify or cancel their reservations before the scheduled lesson has taken place.

Customers can check the schedule and make lesson reservations through a user interface built into the system. Each weekend's schedule includes two fitness classes, with a maximum of 5 participants per class on both Saturday and Sunday. Customers have the option of viewing the schedule by day or by fitness level. This allows customers to easily find the lesson they are looking for without having to search through all the lessons available (Zuriana Abu Bakar et al., 2022). Once the customers have selected a lesson, they can book it and enter their payment information. The system will then automatically generate a receipt with the details of the booking. The system also stores customer information such as name, contact details, and payment information. This allows customers to easily change or cancel their booking when needed.

The system also has a function that lets users rate products numerically and submit reviews. After four weeks (four weekends), this feedback will be saved in the system and utilised to produce reports. These reports will include the average rating for each lesson as well as the number of students per lesson on each day. The type of fitness lessons that have brought in the most money when all of the same kind of lessons are combined will also be disclosed. The Sports Booking System was created to make it simpler for both clients and the club to manage appointments for fitness classes. Customers can also contribute comments through the system, providing the club the chance to enhance its offerings (Zuriana Abu Bakar et al., 2022). This system will be beneficial to both the customers and the club, and will help create a better fitness experience for everyone.

Use of JUnit Testing

Weekend Fitness Club (WFC) can manage customer bookings thanks to the Sports Booking System software. Customers can check the lessons that are offered by day or kind and book a lesson in accordance with the schedule. In addition, consumers have the option to alter a reservation if there are still open places. After each group fitness instruction, the system also logs consumer comments and evaluations. The software publishes a report with the average rating of each session, the number of clients per lesson on each day, and the sort of fitness lessons that brought in the most money after four weeks (four weekends).

Sports Booking System is intended to be intuitive and user-friendly. It is designed with a test driven development approach, using JUnit to ensure the reliability and accuracy of the system. JUnit is a unit testing framework for Java which is designed to write and run repeatable tests. This helps to ensure that the software meets the requirements of the customer and all errors are fixed before the system is released for use (Van Deursen et al., 2018). Additionally, the software is designed with a modular architecture, meaning that the components are decoupled, making it easier to maintain and extend the system.

To test the software, automated tests are written using JUnit. These tests check the functionality of the system such as whether a booking can be made and if a customer can change a booking. Additionally, the tests can also be used to check if the reports are accurate, such as the number of customers per lesson and the average rating. This helps to ensure that the software is working as expected before it is released for use. It is designed with a test driven development approach and JUnit tests to ensure the accuracy and reliability of the system. Additionally, it is designed with a modular architecture which makes it easier to maintain and extend the system (Van Deursen et al., 2018).

Refactoring Used During Development:

During the development of the system, several refactoring techniques were used to improve the code's quality and readability. The main refactoring techniques used were:

- **<u>Extract Method</u>**: This technique was used to extract long and complex code blocks into smaller and more manageable methods. This not only made the code easier to read and understand but also made it easier to maintain and modify.

- **<u>Rename Method</u>**: This technique was used to give more descriptive and meaningful names to methods that had unclear or confusing names. This made it easier for other developers to understand what each method did, leading to improved collaboration and teamwork.

- **<u>Replace Conditional with Polymorphism</u>**: This technique was used to replace long and complex conditional statements with polymorphic classes. This made the code easier to read and understand, as each class had a clear responsibility and purpose.

- **<u>Extract Class</u>**: This technique was used to extract related code into separate classes. This made the code more modular and easier to understand, as each class had a clear responsibility and purpose.

Conclusion:

In conclusion, the system developed for the Weekend Fitness Club provides an effective way to manage bookings and ratings for group fitness lessons. The system allows customers to view and book lessons by day or by fitness type and provides the club with detailed reporting capabilities. The system is designed using object-oriented principles and incorporates several design patterns and refactoring techniques to improve its quality and maintainability. Future improvements could be made to enhance the system's capabilities and provide even greater value to the fitness club and its customers.

Version Control:

https://github.com/hc22aaz/21089179.git

References

Devroey, X., Alessio Gambi, Juan Pablo Galeotti, Just, R., Fitsum Meshesha Kifetew, Panichella, A. and Panichella, S. (2021). JUGE : An infrastructure for benchmarking Java unit test generators. *Software Testing, Verification & Reliability*. [online] doi:https://doi.org/10.1002/stvr.1838.

Devroey, X., Panichella, S. and Gambi, A. (2020). Java Unit Testing Tool Competition. *Proceedings of the IEEE/ACM 42nd International Conference on Software Engineering Workshops*. [online] doi:https://doi.org/10.1145/3387940.3392265.

Macias, K., Mathur, M., Bruce, B.R., Zhang, T. and Kim, M. (2020). WebJShrink: a web service for debloating Java bytecode. *Foundations of Software Engineering*. doi:https://doi.org/10.1145/3368089.3417934.

Mukherjee, R. and K. Sridhar Patnaik (2019). Prioritizing JUnit Test Cases Without Coverage Information: An Optimization Heuristics Based Approach. *IEEE Access*, [online] 7, pp.78092–78107. doi:https://doi.org/10.1109/access.2019.2922387.

Van Deursen, A., Aniche, M., Boone, C., Lopes Cunha, M. and Nadeem, A. (2018). *Software Quality and Testing*. [online] Available at: https://se.ewi.tudelft.nl/cse1110-2019/labwork/jpacman-p0and1.pdf [Accessed 24 Apr. 2023].

Zuriana Abu Bakar, Hassan, R., Shahliza Abd Halim, Kasim, S. and Rohaizan Ramlan (2022). Investigation on Java Mutation Testing Tools. *JOIV : International Journal on Informatics Visualization*, [online] 6(2-2), pp.455–455. doi:https://doi.org/10.30630/joiv.6.2-2.1090.

Working Of Weekend Fitness Club System:

Home Screen:
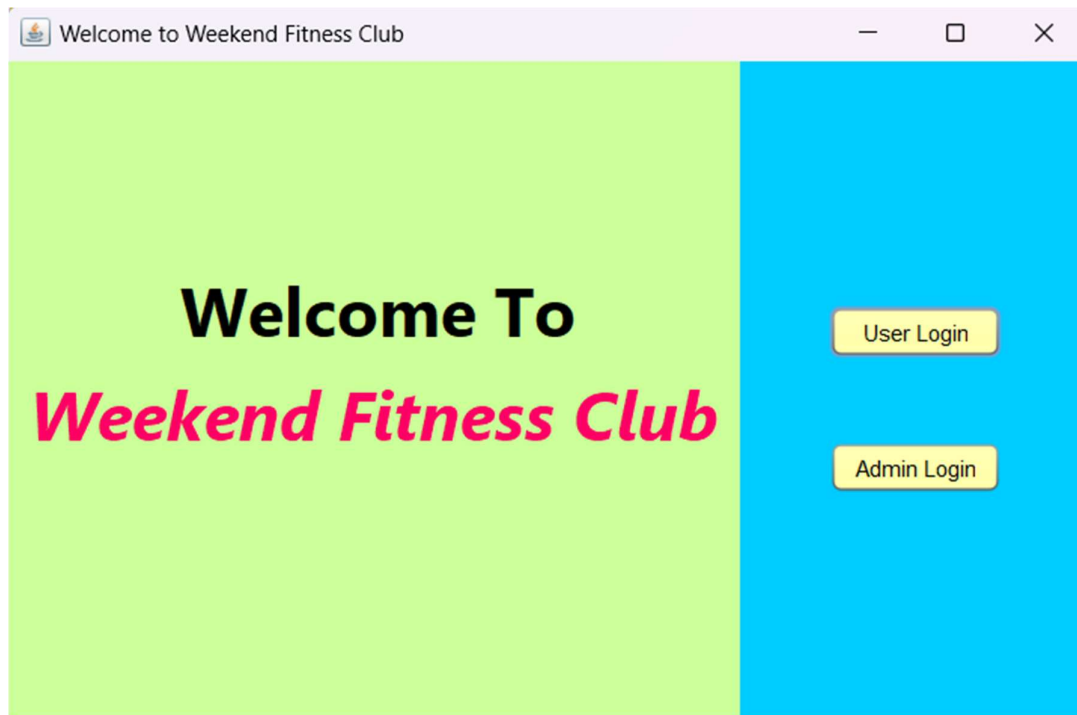
The Very First Page is Welcome to Weekend Fitness Club. This Page allow the user or Admin to select Either Customer/User Login or Admin Login.

#User:

1. User Login:

When Clicked on User Login, It leads to User Login Page . It asks user to enter his/her username and password. It also has a button to go back to the Previous Page that is Home Page. When Clicked on Submit, if Username and Password matches with that in list, then it would give success message and take user to User Dashboard. And if the Username or Password doesn't match, then it would show a dialog box of Incorrect Login.

Below Logins Could be used to for User Login

- Username – Harish , Password – Harish
- Username –Umesh , Password – Umesh
- Username – Mani , Password – Mani
- Username – Sampath , Password –Sampath
- Username – Ajay , Password – Ajay

All these logins are hardcoded and to add or delete any login , Please Update the User Class.

2. User Dashboard:
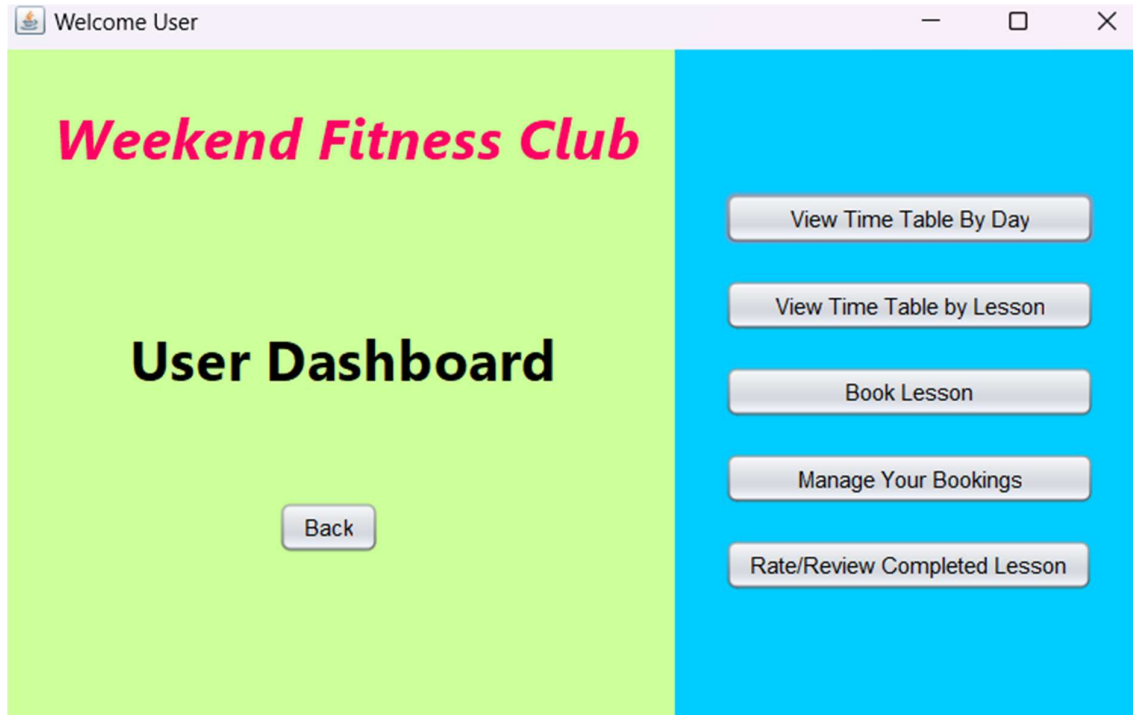
3. View Time Table By Day:

Weekend Fitness Club

Lesson By Day

SATURDAY

SUNDAY

Back

Weekend Fitness Club

Saturday Lesson

Back

type	capacity	day	timeslot	price	week
SPIN	5	Saturday	Morning	10.0	1
YOGA	5	Saturday	Evening	15.0	1
SPIN	5	Saturday	Morning	10.0	2
YOGA	5	Saturday	Evening	15.0	2
SPIN	5	Saturday	Morning	10.0	3
YOGA	5	Saturday	Evening	15.0	3
SPIN	5	Saturday	Morning	10.0	4
YOGA	5	Saturday	Evening	15.0	4
SPIN	5	Saturday	Morning	10.0	5
YOGA	5	Saturday	Evening	15.0	5
SPIN	5	Saturday	Morning	10.0	6
YOGA	5	Saturday	Evening	15.0	6
SPIN	5	Saturday	Morning	10.0	7
YOGA	5	Saturday	Evening	15.0	7
SPIN	5	Saturday	Morning	10.0	8
YOGA	5	Saturday	Evening	15.0	8
SPIN	5	Saturday	Morning	10.0	9
YOGA	5	Saturday	Evening	15.0	9
SPIN	5	Saturday	Morning	10.0	10

Weekend Fitness Club

Sunday Lesson

Back

type	capacity	day	timeslot	price	week
BODYSC...	5	Sunday	Morning	12.0	1
ZUMBA	5	Sunday	Evening	8.0	1
BODYSC...	5	Sunday	Morning	12.0	2
ZUMBA	5	Sunday	Evening	8.0	2
BODYSC...	5	Sunday	Morning	12.0	3
ZUMBA	5	Sunday	Evening	8.0	3
BODYSC...	5	Sunday	Morning	12.0	4
ZUMBA	5	Sunday	Evening	8.0	4
BODYSC...	5	Sunday	Morning	12.0	5
ZUMBA	5	Sunday	Evening	8.0	5
BODYSC...	5	Sunday	Morning	12.0	6
ZUMBA	5	Sunday	Evening	8.0	6
BODYSC...	5	Sunday	Morning	12.0	7
ZUMBA	5	Sunday	Evening	8.0	7
BODYSC...	5	Sunday	Morning	12.0	8
ZUMBA	5	Sunday	Evening	8.0	8
BODYSC...	5	Sunday	Morning	12.0	9
ZUMBA	5	Sunday	Evening	8.0	9
BODYSC...	5	Sunday	Morning	12.0	10

3. View Time Table By Lesson:

Weekend Fitness Club

Lesson By Type

SPIN

YOGA

BODYSCULPT

ZUMBA

Back

Weekend Fitness Club

Spin Lessons

type	capacity	day	timeslot	price	week
SPIN	5	Saturday	Morning	10.0	1
SPIN	5	Saturday	Morning	10.0	2
SPIN	5	Saturday	Morning	10.0	3
SPIN	5	Saturday	Morning	10.0	4
SPIN	5	Saturday	Morning	10.0	5
SPIN	5	Saturday	Morning	10.0	6
SPIN	5	Saturday	Morning	10.0	7
SPIN	5	Saturday	Morning	10.0	8
SPIN	5	Saturday	Morning	10.0	9
SPIN	5	Saturday	Morning	10.0	10

Back

Weekend Fitness Club

Yoga Lesson

Back

type	capacity	day	timeslot	price	week
YOGA	5	Saturday	Evening	15.0	1
YOGA	5	Saturday	Evening	15.0	2
YOGA	5	Saturday	Evening	15.0	3
YOGA	5	Saturday	Evening	15.0	4
YOGA	5	Saturday	Evening	15.0	5
YOGA	5	Saturday	Evening	15.0	6
YOGA	5	Saturday	Evening	15.0	7
YOGA	5	Saturday	Evening	15.0	8
YOGA	5	Saturday	Evening	15.0	9
YOGA	5	Saturday	Evening	15.0	10

Weekend Fitness Club

Bodysculpt Lesson

Back

type	capacity	day	timeslot	price	week
BODYSC...	5	Sunday	Morning	12.0	1
BODYSC...	5	Sunday	Morning	12.0	2
BODYSC...	5	Sunday	Morning	12.0	3
BODYSC...	5	Sunday	Morning	12.0	4
BODYSC...	5	Sunday	Morning	12.0	5
BODYSC...	5	Sunday	Morning	12.0	6
BODYSC...	5	Sunday	Morning	12.0	7
BODYSC...	5	Sunday	Morning	12.0	8
BODYSC...	5	Sunday	Morning	12.0	9
BODYSC...	5	Sunday	Morning	12.0	10

Weekend Fitness Club

Zumba Lesson

type	capacity	day	timeslot	price	week
ZUMBA	5	Sunday	Evening	8.0	1
ZUMBA	5	Sunday	Evening	8.0	2
ZUMBA	5	Sunday	Evening	8.0	3
ZUMBA	5	Sunday	Evening	8.0	4
ZUMBA	5	Sunday	Evening	8.0	5
ZUMBA	5	Sunday	Evening	8.0	6
ZUMBA	5	Sunday	Evening	8.0	7
ZUMBA	5	Sunday	Evening	8.0	8
ZUMBA	5	Sunday	Evening	8.0	9
ZUMBA	5	Sunday	Evening	8.0	10

Back

4. Book Lesson:

Weekend Fitness Club

Book Lesson

Note:

Please enter Your Username same as in Login For Confirmation

Please enter Your Username same as in Login

Lesson should be Written in Capital Letters

Day will either Saturday and Sunday

Time Slot Will be Morning or Evening

Week will be from 1 to 10

To Cancel, Write all the details First and then click on Cancel

Username:

Lesson:

Day:

TimeSlot:

Week:

Back   Submit

Cancel Your Booking

5. Manage Bookings:

username	Lesson	day	timeslot	week

Weekend Fitness Club

Bookings by Customer

Back

6. Rate Lesson:

Weekend Fitness Club

Rate Lesson

Note:

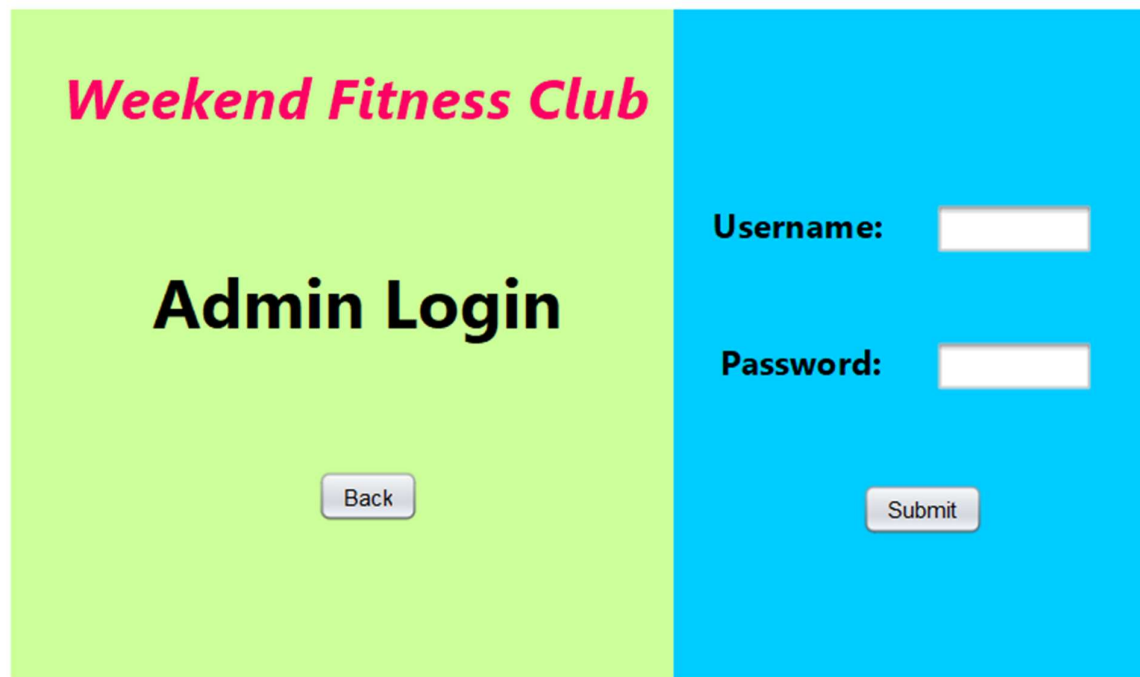Please enter Your Username same as in Login For Confirmation

Back

Username:

Lesson:

Rating:

Submit

p

Admin :

1. Admin Login:

When Clicked on Admin Login, It leads to Admin Login Page . It asks user to enter his/her username and password. It also has a button to go back to the Previous Page that is Home Page. When Clicked on Submit, if Username and Password matches with that in list, then it would give success message and take person to Admin Dashboard. And if the Username or Password doesn't match, then it would show a dialog box of Incorrect Login.

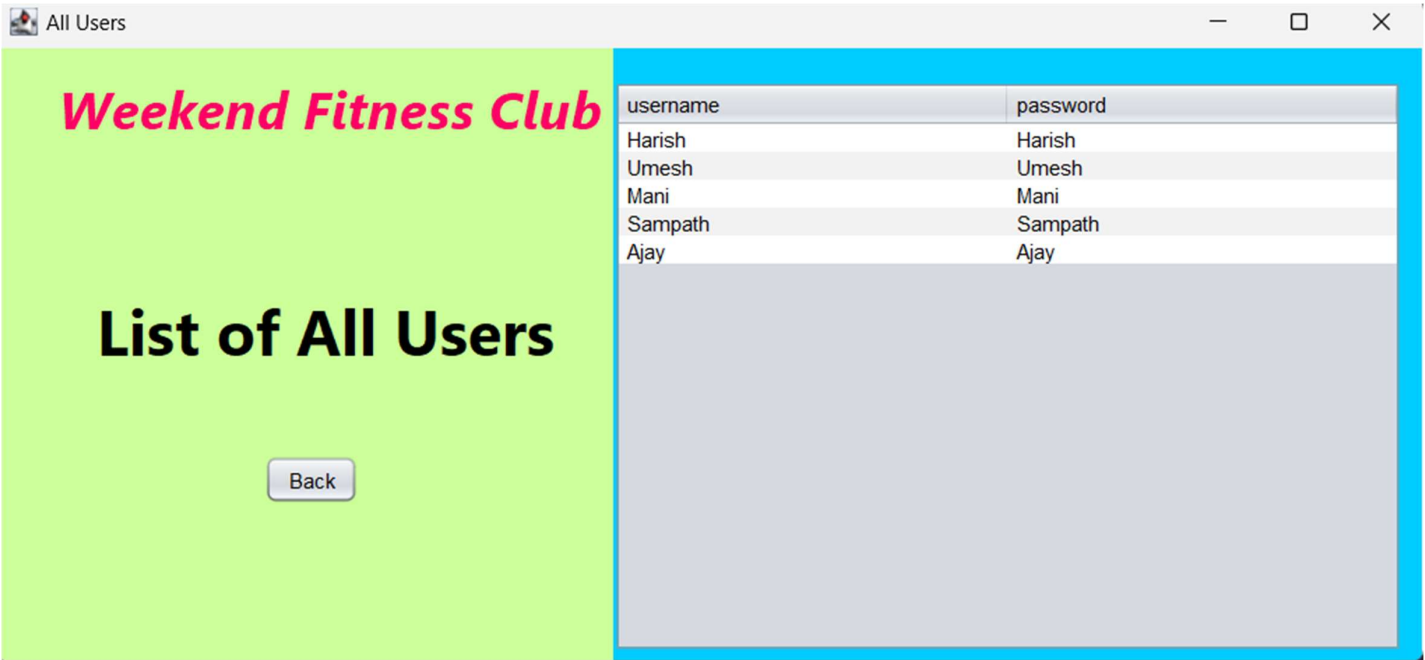Below Logins Could be used to for User Login

- Username – admin , Password – admin

This login is hardcoded and to add or delete any login , Please Update the User Class.

2. Admin Dashboard:
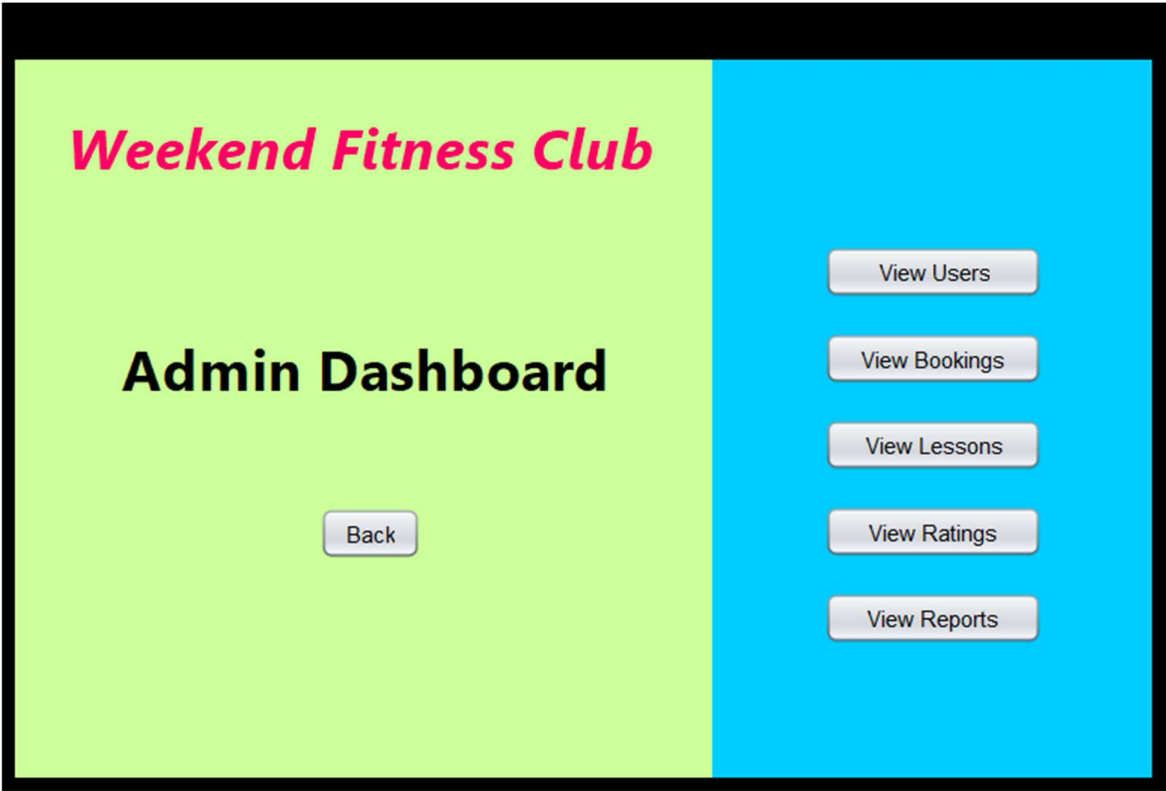
2. View Users:

3. View Bookings:

username	Lesson	day	timeslot	week

Bookings by Customer

Back

4. View Lessons:

List of All Lesson

Back

type	capacity	day	timeslot	price	week
SPIN	5	Saturday	Morning	10.0	1
YOGA	5	Saturday	Evening	15.0	1
BODYSC...	5	Sunday	Morning	12.0	1
ZUMBA	5	Sunday	Evening	8.0	1
SPIN	5	Saturday	Morning	10.0	2
YOGA	5	Saturday	Evening	15.0	2
BODYSC...	5	Sunday	Morning	12.0	2
ZUMBA	5	Sunday	Evening	8.0	2
SPIN	5	Saturday	Morning	10.0	3
YOGA	5	Saturday	Evening	15.0	3
BODYSC...	5	Sunday	Morning	12.0	3
ZUMBA	5	Sunday	Evening	8.0	3
SPIN	5	Saturday	Morning	10.0	4
YOGA	5	Saturday	Evening	15.0	4
BODYSC...	5	Sunday	Morning	12.0	4
ZUMBA	5	Sunday	Evening	8.0	4
SPIN	5	Saturday	Morning	10.0	5
YOGA	5	Saturday	Evening	15.0	5
BODYSC...	5	Sunday	Morning	12.0	5

The Lesson List is Hardcoded to Store Lesson for 10 Weeks. Thus Making Total Lessons to be 10*4=40.

4. View Ratings:

4. View Reports:

Thank You. This Marks the Ending of Weekend Fitness Club Management System Working.