Tribhuvan University

Faculty of Humanities and Social Sciences

Futsal Management System

Project Report

Submitted to

Department of Computer Application

Everest Innovative College

Solteemode, Kathmandu

In partial fulfillment of the requirements for the Bachelors in Computer Application

Submitted by

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Bachelor in Computer Applications (BCA)

SUPERVISOR'S RECOMMENDATION

I hereby recommend that this project prepared under my supervision by **Rohan Shrestha** entitled **"Futsal Management System"** in the Partial Fulfillment of requirement for the degree of Bachelor in Computer Application is recommended for that final evaluation.

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LETTER OF APPROVAL

This certify that this project is prepared by **Rohan Shrestha** entitled **"Futsal Management System"** in the Partial Fulfillment of requirement for the degree of Bachelor in Computer Application has been evaluated. In our opinion it is satisfactory in the scope and quality as a project for the required degree.

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ABSTRACT

The Futsal Management System is a web-based application that has changed how futsal courts are managed and booked in Kathmandu by providing a comprehensive platform for both futsal business owners and clients. Futsal, an indoor soccer variant, is becoming increasingly popular around the world, and this project aims to improve the local futsal experience. The main goal is to provide an easy-to-use platform that links futsal business owners with customers. Customers may quickly reserve futsal courts online, while business owners can effectively display and manage their services, including court characteristics, locations, amenities, time slots, and price. To construct a responsive and user-friendly website, this project employs a technology stack that comprises HTML, CSS, Bootstrap, JavaScript, React, Java, and the Spring framework. It facilitates court bookings by providing services such as search, secure payments, alerts, and client feedback. Futsal Management System aims to simplify the court booking process in Kathmandu by providing a user-friendly and efficient platform for futsal business owners and clients. By utilizing advanced features like as search and filtering capabilities, secure payment integration, alarms, and customer reviews, the application provides a smooth and organized experience, ultimately enhancing the whole futsal ecosystem.

Keywords: **Futsal Management System, Comprehensive platform, Spring Framework, Search and filtering , court booking**

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Yours sincerely,
Rohan Shrestha

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LIST OF ABBREVIATION/ACRONYM

Abbreviation/Acronym	Description
CSS	Cascading Style Sheet
DB	Database
DBMS	Database Management System
ER	Entity Relationship
FMS	Futsal Management System
HTML	Hypertext Markup Language
MS	Microsoft
MYSQL	My Structured Query Language
SDLC	System Development Life Cycle

CHAPTER 1 :

INTRODUCTION

1.1 Introduction

Futsal is a variant of soccer that is played indoors on a smaller field with a smaller ball and a reduced number of players per team. This web application provides varieties of futsal located inside Kathmandu area which can be booked through online.

This project's main objective is to build a platform for connecting futsal business owners and customers. This system is an online booking tool created to make it simple for customers to reserve the futsal they want for the time that works best for them. The futsal business owner can easily list and manage all of their varied services here. Customers who are interested in booking futsal can browse all of the alternates and book the futsal easily on short period of time. The physical appearance-based booking process for futsal is replaced by this web application. This project also makes it simple to navigate to the futsal court, as finding a futsal court requires a lot of effort, time and frustration. Along with simple bookings and a variety of payment options through the web application, it also offers customers a seamless and organized experience.

This web-based application provides a user-friendly and visually appealing experience by utilizing cutting-edge web development technologies like HTML, CSS, Bootstrap for responsive design, JavaScript for interactivity, React for dynamic user interfaces, and Java with the Spring framework for robust backend functionality. It brings together the active futsal community in the Kathmandu region, creating convenience, accessibility, and a rekindled excitement for the game, ultimately making futsal more pleasant and accessible for all parties involved.

1.2 Problem Statement

Many futsal organizations in Nepal are now operational but have lacking productive potential. Some have used social media platforms successfully to acquire recognition, but many have yet to adopt the digital age. The primary obstacle is the perceived high expense of developing an online platform. As a result, they struggle to get the attention they deserve. Traditional booking techniques, such as phone calls or in-person bookings, continue to be used, generating difficulties. Furthermore, the increasing demand for futsal facilities has

not been met by an appropriate quantity of quality venues, making it difficult for players and teams to obtain open slots, particularly during peak hours. The lack of pricing transparency also adds to the frustration.

To address these challenges, there is a need for a suitable online interface connecting futsal facility owners and customers. Such a platform would empower futsal businesses to showcase their services, allowing potential clients to explore their options before making bookings. FMS project provide the best solution for booking futsal facilities in Nepal and enhancing transparency for both facility owners and users, ultimately contributing to the growth of the futsal industry in the country.

1.3 Objective

The main objective of this project is to provide best features for both parties as mentioned below:

- To locate the nearest available futsal court using Haversine algorithm
- To develop platform where user can online reservation for futsal

1.4 Scope and Limitation

FMS is a web-based application that is designed to provide a comprehensive and user-friendly platform for customers to reserve futsal for the time that works best for them, as well as for futsal business owners to easily list and manage all of their various services. This replaces physical appearance-based booking process for futsal which saves time, energy and hectic process.

1.4.1 Scope

Enhancing operational effectiveness, customer satisfaction, and financial success is the primary goal of this initiative. Organizations that are not for profit can use the system. Every type of user with a profile in the application can access this system, and the owner of the futsal facility can post information about their organization and customer can reserve a court. The scope of the project includes the following key features:

- **User Registration and Authentication:** The web application allow users to create accounts and log in securely. This feature ensures that only registered users can access.
- **Futsal Court Listing:** Futsal business owners have the ability to list their courts on the platform. They can provide details such as court name, location, facilities, available

time slots, and pricing information.

- **Booking Management:** Customers can be able to select a futsal court, choose a preferred date and time slot, and book it. The system handles the booking process, ensuring that no conflicting bookings occur for the same court and time slot.
- **Payment Integration:** The web application integrates payment gateways to enable secure online transactions. Customers can make payments for their bookings using various payment methods, providing a seamless and convenient experience.
- **Admin Panel:** An admin panel is available for system administrators to manage user accounts, monitor bookings, handle disputes, and ensure the smooth operation of the platform.

1.4.2 Limitations

Despite having a number of helpful features, the proposed web application has several restrictions that need to be taken into account. First off, the application is only available in the Kathmandu region, which means people outside of this zone might not be able to access it or use it. Additionally, the information provided by company owners is dependent on the availability and accuracy of futsal court listings, which may result in inconsistencies with bookings. In order to access and use the platform, users also require a dependable internet connection, which can be difficult in places with poor or unstable connections. Given that some users might not be accustomed to or at ease using online platforms for such transactions, user adoption and accessibility could be a constraining factor. Addressing these limitations would contribute to a more robust and user-friendly experience for both customers and administrators. Additionally, local laws and payment gateway agreements may limit users' options by limiting the availability of particular payment solutions. Technical concerns including browser or device compatibility problems, security flaws, or scalability issues could also occur. For these restrictions to be properly addressed or communicated to consumers, they must be taken into account during the design and development phases.

1.5 Development Methodology

The Waterfall Model was the first Process Model to be introduced, and it was referred to as a linear-sequential life cycle model. The waterfall method separates the process of software development into different stages. In the Waterfall model, the outcome of one phase provides as the input to the next phase in a linear way. As a result, there is no overlapping between the phases, making it simple and easy to follow. [1]

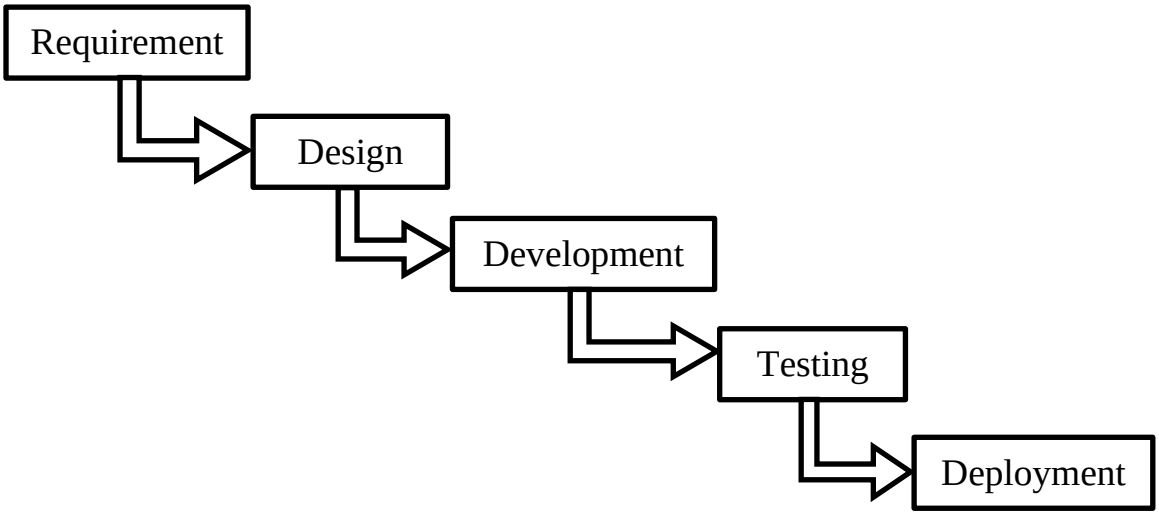


Figure 1.1: Waterfall Methodology of FMS

Requirements Analysis: In the planning phase of the project, detailed information about its requirements was gathered. This phase aimed to understand the needs of users, the necessary features, functionalities, and any specific business rules related to booking futsal facilities in the Kathmandu area.

Design: In the design phase, based on the requirements gathered earlier, a blueprint for the system was created. For the futsal booking system, this phase defined the layout of the website or application, established the user experience (UX) design, and specified technical details such as the programming language and database management system.

Development: During this stage, coding takes place. The chosen technology stack, including HTML, CSS, Bootstrap, JavaScript, React, Java, and the Spring framework, was used to build the actual software. This is where the website or application started taking shape, with features like user registration, booking forms, payment processing, and database integration being implemented.

Testing: Once all coding is done, testing of the product can begin. In the context of the futsal booking system, this phase verified that customers could book facilities without

errors, payments were secure, and the platform was easy to navigate.

Deployment: Following thorough testing and issue resolution, the Deployment phase focused on installing the futsal booking system locally within the academic environment, to access and book futsal facilities through the system on the local computers. This phase ensured system stability, security, and readiness for evaluation and use within the academic institution's-controlled environment.

1.6 Report Organization

Introduction

This chapter deals with the introduction of the system with its objectives and limitations along with the reason why the system is made.

Background Study and Literature Review

This chapter defines and describes Background Study and Overview of related existing systems.

System Analysis and Design

This chapter focuses on the different requirement of the system, which describes about the functional, non-functional, feasibility analysis, Data Modeling (ER-Diagram), Process Modeling (DFD), Architectural Design, Database Schema Design and so on.

Implementation and Testing

This chapter focuses on the tools used in system development, implementation specifics, and test results.

Conclusion and Future Recommendation

This chapter presents a concise summary of the project's results, lessons learned, and conclusion. It also explains what has been done and potential future improvements.

CHAPTER 2 :

BACKGROUND STUDY AND LITERATURE REVIEW

2.1 Background Study

The current system employed in the Futsal Court relies solely on a manual process, which poses several limitations for both staff and customers. The existing method involves recording all booking data in a logbook, requiring users to either call or physically visit the Futsal Court to check court availability.

Once users confirm court availability, staff members manually check the logbook to retrieve recorded booking data. If the court is available at the requested time, customers proceed with the booking process. The staff then updates the logbook to reflect the new booking information. However, in cases where the court is already booked, the booking process is automatically terminated. This manual system presents several challenges. It is time-consuming for both staff and customers, as they need to physically interact and perform multiple manual tasks. Additionally, relying on a logbook increases the risk of errors, such as double bookings or incorrect data entry which lead to conflicts and customer dissatisfaction. Customers may face disappointment when they visit the Futsal Court only to find that the court they wanted is already booked. By digitizing the booking process, customers can easily access real-time court availability through a user-friendly web application. This eliminates the need for physical visits or phone calls, providing greater convenience and saving time for both customers and staff.

Furthermore, the system can provide comprehensive reporting and analytics features, allowing staff members to analyze booking patterns, peak hours, and customer preferences. This data-driven approach enables the Futsal Court to optimize their operations, allocate resources efficiently, and make informed business decisions.

2.2 Literature Review

Futsal is a rapidly growing sport around the world, and its popularity has led to an increase in the number of futsal facilities. As a result, the need for efficient futsal management systems has also increased. Several studies have focused on the development and implementation of futsal management systems to improve operational efficiency, customer satisfaction, and financial performance.

hamrofutsal

hamrofutsal is a domestic online website for booking a futsal. The website was informative was easy to navigate and use. But it is not working properly at the moment as it is on trial phase. It can show futsal from different cities but right now it is not working. This was not so nice experience to use the website. [2]

Playo

Playo is a comprehensive sport booking platform that allows users to find and book various sports facilities, including futsal courts. It operates in multiple cities and provides information about court availability, pricing, and amenities. Playo also offers features like online payment options, reviews and ratings of the facilities, and the ability to connect with other players for matches or events. [3]

BookMySports

BookMySports is an online platform dedicated to sports bookings, and it includes futsal court reservations. The website provides a user-friendly interface where you can search for available futsal courts in different cities. You can view detailed information about the facilities, such as court specifications, pricing, and user reviews. BookMySports also allows you to make online payments and manage your bookings through their platform. [4]

Khel Now

Khel Now is a sports platform that covers various aspects of sports, including futsal court bookings. They have a dedicated section on their website where you can search for available futsal courts in specific regions. Khel Now provides comprehensive information about the facilities, including pricing, court dimensions, and user ratings. They also offer directions to the venues and the option to make online reservations. [5]

Just Play Sports

Just Play Sports is an online platform that focuses on sports bookings and event organization. They offer the convenience of booking futsal courts through their website or mobile app. Just Play Sports provides real-time court availability, allowing you to check and book available slots. The platform also features online payment options, user reviews, and the ability to organize events or tournaments. [6]

Sportsgram

Sportsgram is an online sport booking platform that covers various sports facilities, including futsal courts. Although Sportsgram operates in specific regions, it provides a user-friendly interface for finding and booking available futsal courts. You can browse

through the available options, view pricing details, and make bookings through their website or mobile app. [7]

A futsal management system using the internet of things (IoT) technology. The system allowed customers to book futsal courts online, while facility administrators could manage court availability, league scheduling, team registration, and financial tracking. The authors found that the system improved operational efficiency and customer satisfaction and reduced energy consumption. [8]

FMS using the cloud computing platform. The system allowed customers to book futsal courts online and track their booking histories, while facility administrators could manage court availability, league scheduling, and financial tracking. The authors found that the system reduced administrative workload, increased customer engagement, and improved data security. [9]

A web-based futsal management system for a futsal facility in Portugal. The system allowed customers to book futsal courts online, while facility administrators could manage court availability, league scheduling, team registration, and financial tracking. The authors found that the system improved operational efficiency, increased customer satisfaction, and generated additional revenue for the facility. [10]

In conclusion, the literature suggests that futsal management systems can improve operational efficiency, customer satisfaction, and financial performance. The studies highlighted the importance of user-friendly interfaces, efficient database design, secure data storage, and data analytics for futsal management systems. Further research is needed to investigate the long-term impacts of futsal management systems and their potential to drive innovation in the sports industry.

CHAPTER 3 :

SYSTEM ANALYSIS AND DESIGN

3.1 System Analysis

3.1.1 Requirement Analysis

To establish clear understanding of what the system should do, how it should behave, and what constraints or limitations it should face, there are several analyses performed. The functional and non-functional requirements of the application are given below:

Functional requirements

Functional requirements are the features that the developing system must have. The functional requirement of that we identified are:

For Admin

- The system should allow admin to login and logout of the system
- The system should allow admin to manage the users and futsal owners.
- The system should allow admin to manage futsal
- The system should have feature to allow admin to manage contact us query.

For Users

- The system should be able to login/signup users in the system.
- The system should allow user to give their details.
- The system should allow user to view the reservation.
- The system should allow user to view payment details.
- The system should allow user to give messages through contact us query.

For Futsal Owner

- The system should be able to login in the system.
- The system should allow user to add and edit their Futsal information.
- The system should allow user to monitor payment status.
- The system should allow user to view details of the person booking the futsal.

Use case diagram

In the Futsal Management System, there are three main actors: Admin, Customer, and Futsal Owner. Admin is responsible for managing the system, the Customer interacts with

the application to browse and book futsal courts, and the Futsal Owner manages their futsal court listings.

The admin has several processes available to them and can log into the system to access administrative features and log out when finished. Admin can manage customers, including creating, reading, updating, and deleting customer profiles. They can also manage futsal owners, handling tasks such as creating and editing owner profiles. Admin is responsible for managing contact queries, which involves viewing and responding to queries received from customers and futsal owners.

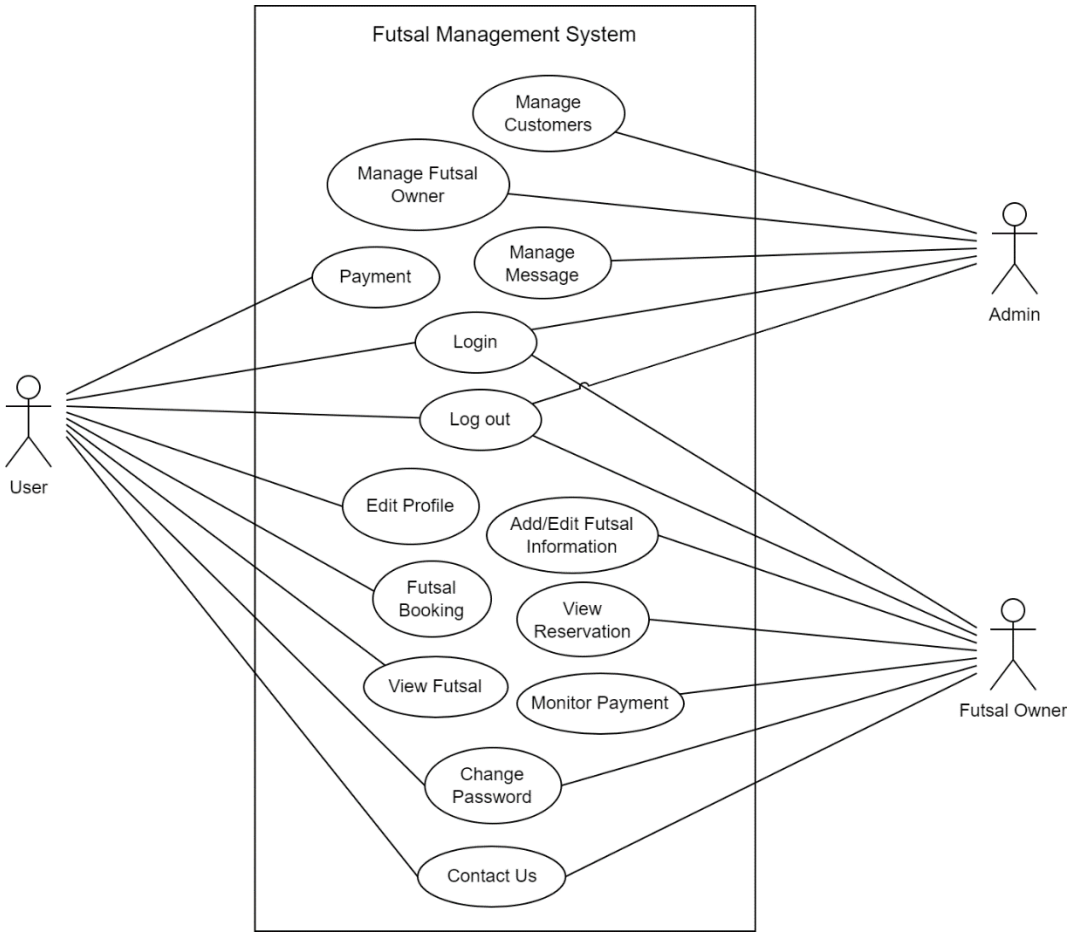


Figure 3.1: Use case diagram of FMS

The Customer interacts with the application to browse and book futsal courts. They can register and log into their accounts, explore various futsal options, make reservations for desired courts, view reservation details, communicate with futsal owners, edit their profile information, and change their passwords.

The Futsal Owner has functionalities related to managing their futsal court listings. They can add futsal information, edit and delete existing information, change their password, monitor payment status, and view details of customers who have booked their futsal courts.

The use case diagram illustrates the interactions and functionalities of the Futsal Management System, highlighting the actions that the Admin, Customer, and Futsal Owner can perform within the system. It provides a clear overview of the system's capabilities and the roles played by different actors in the futsal management process.

Non –functional requirements

Non-functional requirements make the functioning of the system easier and effective. The non–functional requirements of this project are:

- **Availability**

  Users can rely on consistent and timely access to the application's services, ensuring a seamless experience every time they interact with it. Furthermore, the system is designed to be compatible with various web browsers, including Chrome, Firefox, Microsoft Edge, and others. This cross-browser compatibility ensures that users can access and utilize the application regardless of their preferred web browser, enhancing its accessibility and usability for a broader audience.

- **Security**

  Security is a paramount concern, and the system ensures that users are shielded from unauthorized access. Each user is required to authenticate themselves using their unique email and password combination, adding an additional layer of protection. Furthermore, the application employs Spring Security to safeguard user passwords. This comprehensive security framework helps in the secure management of user credentials, preventing unauthorized individuals from gaining access to sensitive information or unauthorized use of the system. Users can confidently rely on system's robust security measures to keep their data and interactions safe and protected.

- **Usability**

  Usability and user experience are top priorities for this application. It is designed to be exceptionally user-friendly and easy to navigate. Users will find the interface intuitive and straightforward, with a focus on providing clear and informative service navigation. The interactive elements of the application enhance the overall user experience, making it a seamless and enjoyable process to access and utilize the services. Whether users are booking futsal courts or managing their accounts, the application's design ensures that the entire experience is smooth, informative, and interactive, ultimately contributing to a positive and user-centric environment.

3.1.2 Feasibility Analysis

The feasibility study concluded that the project is able to be implemented successfully as it was carefully planned.

a. Technical Feasibility Study

This project is entirely a web-based system. The following are the primary tools and technologies that has been utilized in this system to make this project more feasible:

Table 3.1: Technical Feasibility Study of FMS

Technological Knowledge	Hardware Requirements	Software Requirements
HTML	Laptop	MS Office
CSS	Keyboard	Intellij
React	Mouse	Postman
Java		Photoshop
Spring Framework		Browsers
MySQL		Lucid chart
Bootstrap		Project Libre
		Visual Studio
		Figma

Most of the technologies used are freely available and technical skills are manageable so this project is technically feasibility.

b. Operational Feasibility Study

As there is no proper marketplace for FMS, establishing and hosting this web application provide a suitable platform for both futsal owners and customers. This system is fully functional, able to be successfully deployed, and feel simple to use while booking the futsal because it is very user-friendly. It incorporates all requirements utilized for futsal management systems.

c. Economic Feasibility Study

This FMS project is an academic project so that most of the software's would be manageable. We only be needing a laptop and a working internet connection to run the

application. As a result, no economic feasibility assessment is required.

3.1.3 Data Modeling (ER-Diagram)

This ER (Entity Relationship) diagram represent the model of this project. It represents all the entity involved in the system and their relation among one another. There are four major entities names Admin, Customer, Futsal and Payment. Each entity has their own attributes representing the properties of the entity.

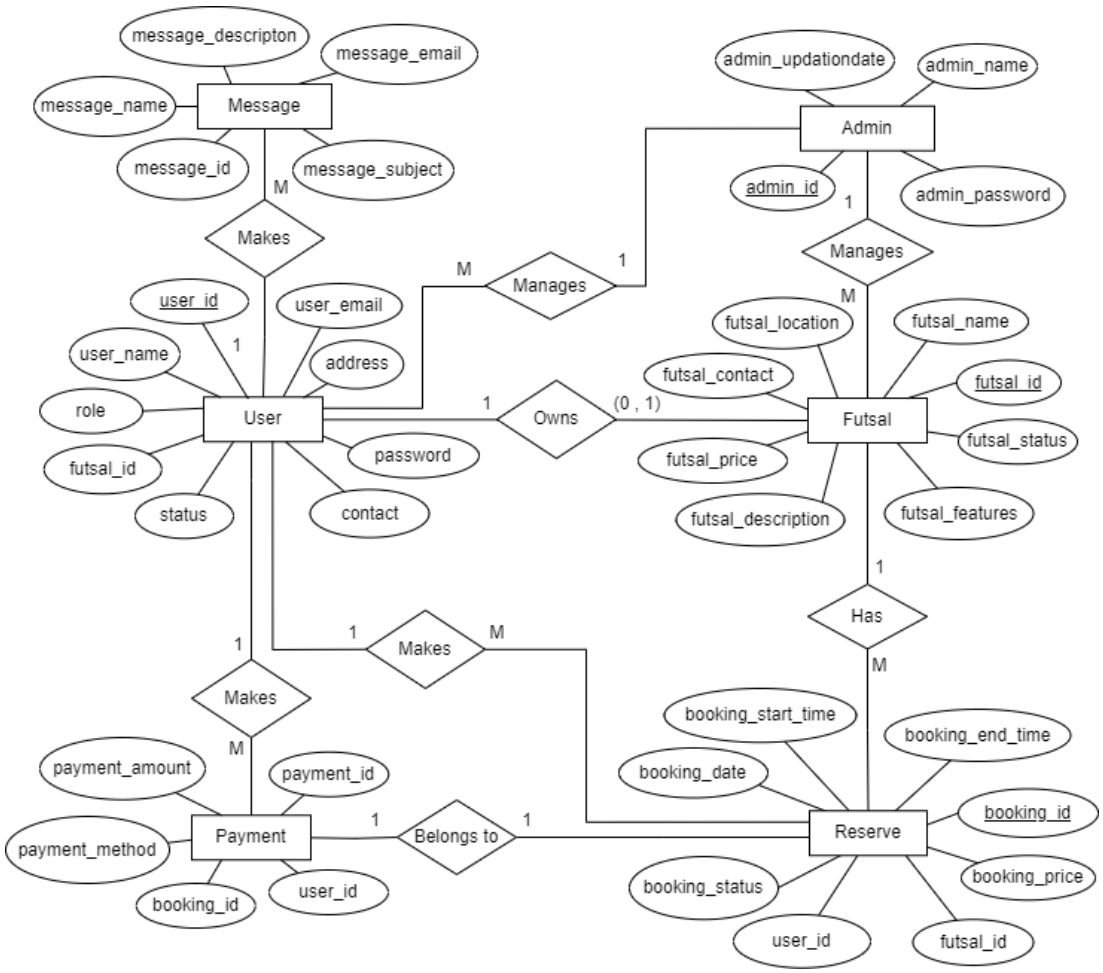


Figure 3.2: ER-Diagram of FMS

Customers can explore various futsal's located in different locations where they can see their description, price, features and many more. And they can book the futsal at the available and suitable time where they all can play. When they book the futsal there are various methods for payment, a customer can choose anyone method and do the online transaction so that even if the customer doesn't come, futsal owner should not get loss at their business.

In the above figure there are four entities they are Futsal, Customer, Payment and Admin. Here, each entity has their own attributes and attribute like id are set as primary key to make it unique. All Entities are connected through different relationships having their own specific works to perform. Here customer books a futsal and makes payment, futsal can accept/monitor the payment and they are booked by the customers whereas admin can manage both customers and futsal.

3.1.4 Process modelling (DFD)

Data Flow Diagram (DFD) shows the flow of data from external entities into the system, and from one process to another within the system. It is a tool used in software engineering to model, analyze, and design information systems. Following diagram is context diagram which is used for representing the flow of data in the FMS.

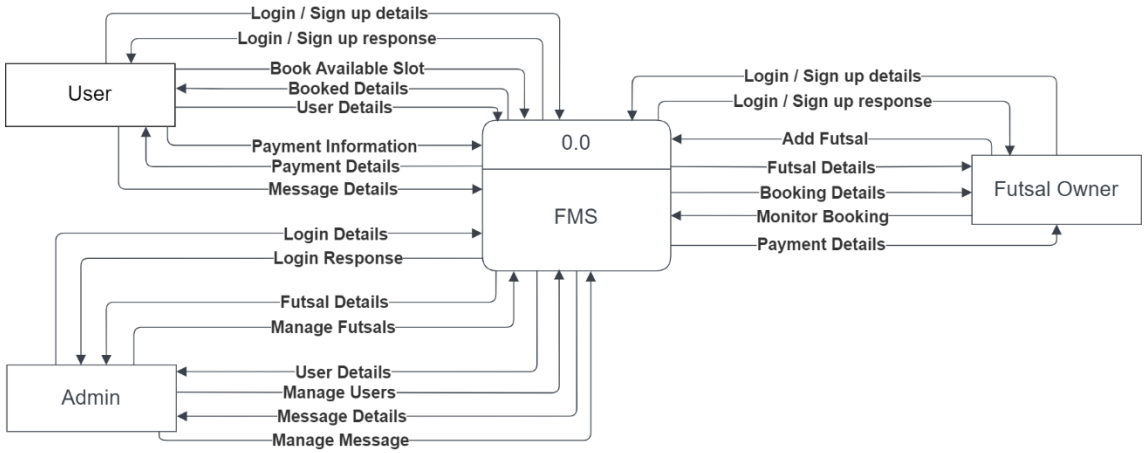


Figure 3.3: Context Diagram of FMS

In the above context diagram, we can see the overview of the whole system. Data to the system comes from three entity: admin, customer and futsal owner. Admin can login, manage the reviews, users and futsal. Users can login/signup, view futsal, booking, make and do payment actions, give rating to the futsal and can send reviews. Futsal owner can login/signup, add their futsal, give feedback, accept payments through different methods and can make their futsal available for booking.

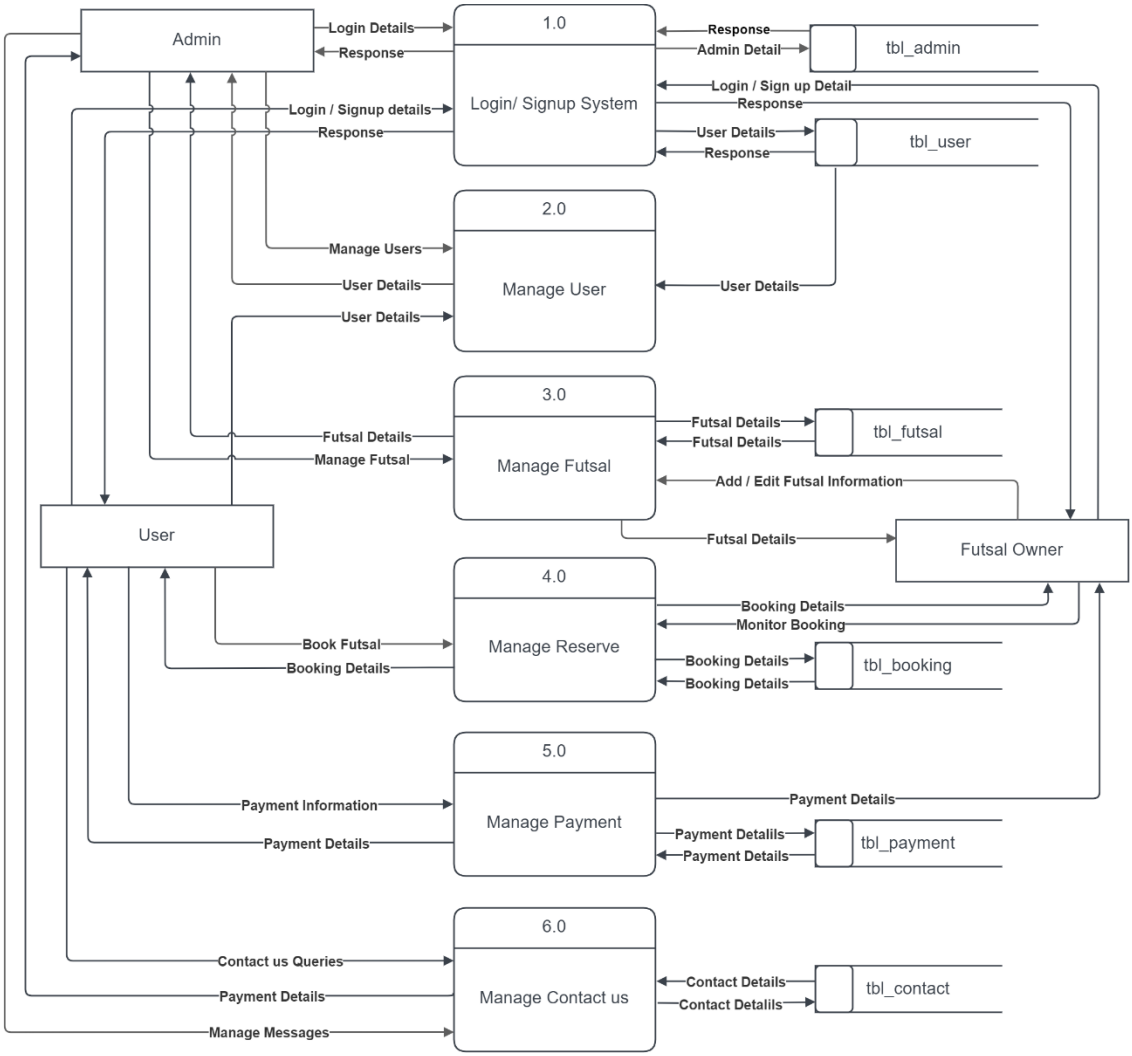


Figure 3.4: Level 1 DFD of FMS

In the above level 1 diagram, we can see the further breakdown of the system, there are six process, login/signup process, user management, futsal management, booking management, payment management and manage contact us queries. The data flow through these processes to perform all the functionalities of the application. To flow data through each process, tables in db are created where all the data are stored and retrieved whenever it is needed. The login/signup system, is responsible for user authentication and registration. The user management has all the data of customer so that they don't have to put their details again and again for booking. Likewise, futsal management has also data of futsal so that any customer can explore them without any problems. The payment management is responsible for all type of transaction which performed under this system. At last, contact us system contains data which are sent by customers so that futsal and admin can feedback them for better interactive of the system.

3.2. System Design

To realize the different functional requirement of the system in graphical form, different design diagram of the system has been prepared which are as follows:

3.2.1. Architectural Design

The proposed system follows a 3-Tier web-based architectural design, utilizing a Client/Server Architecture. This architectural approach ensures the separation of concerns and allows for independent development and maintenance of the user interface, functional process logic, computer data storage, and data access modules. Each tier operates on different platforms, providing flexibility and scalability to the system. By adopting this architecture, the system can achieve modularity, scalability, and maintainability.

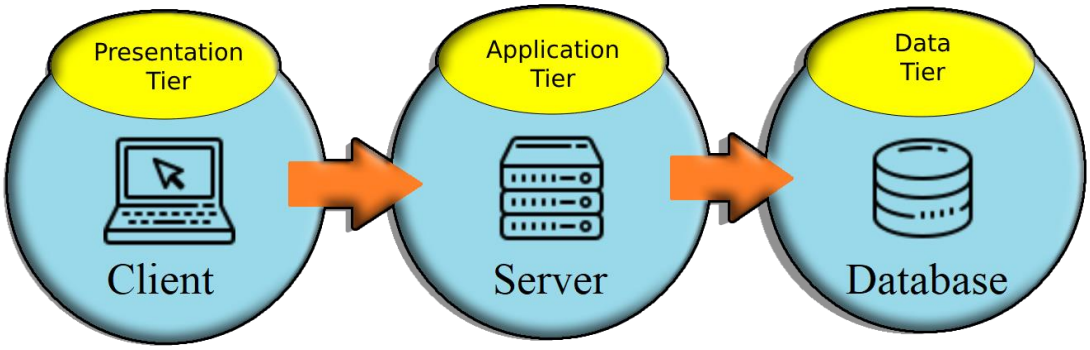


Figure 3.5: Three Tier Architecture of FMS

Presentation Tier (Client): In this system, presentation tier is responsible for the user interface, where customers interact. Users can browse futsal courts, choose time slots, and make bookings. Technologies like React are used to create a user-friendly and responsive experience. This tier allows customers to navigate futsal options, select slots, and initiate bookings. Separating this tier enables independent development and updates for the user interface, offering design and functionality flexibility.

Application Tier (Server): The application tier is at the heart of the system, handling tasks such as user identification, booking validation, and database interaction. It handles booking requests, checks availability, and keeps the database up to date. It also handles user authentication to guarantee that only authorized people make reservations. This tier's separation allows for autonomous development and maintenance of booking logic, allowing for new additions and adjustments.

Data Tier (Database): The data tier is a critical component of a system that stores essential information such as user profiles, futsal court details, and booking records. It is usually implemented using a strong DBMS like MySQL. This tier ensures data integrity and offers a structured approach to store and retrieve data. By separating it from the application and presentation tiers, it enables independent management of database schema and data access. This separation ensures that data remains consistent and accessible while modifications are made to other parts of the system.

3.2.2. Database Schema Design

The figure below is the database schema design of Futsal Management System. Database schema design is used to show basic structure of the system. In this system, there are six tables in the databases each of them has their own fields where their id is primary key and if that id is used in another table, it becomes foreign. There is data type of each entity and the foreign key in schema is represented by the arrow as shown in the diagram.

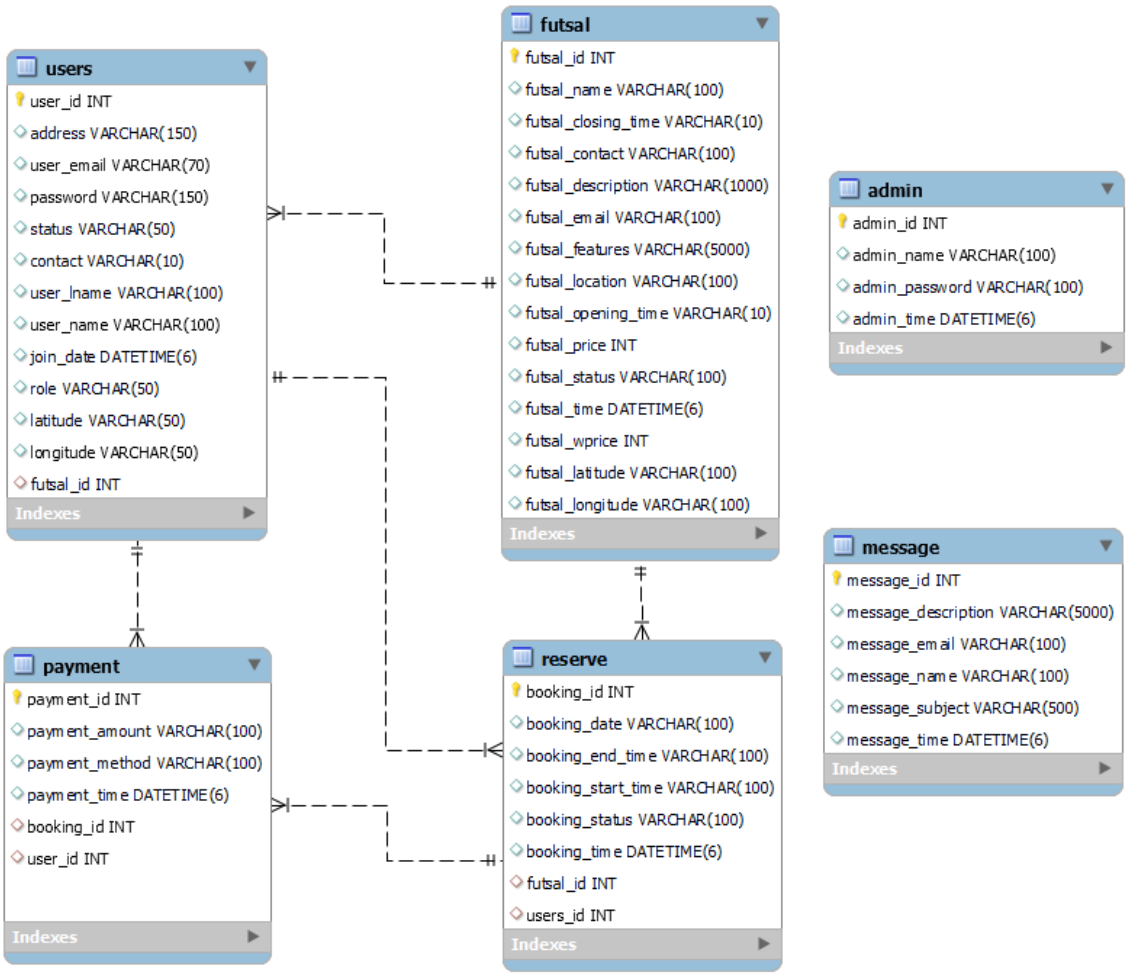
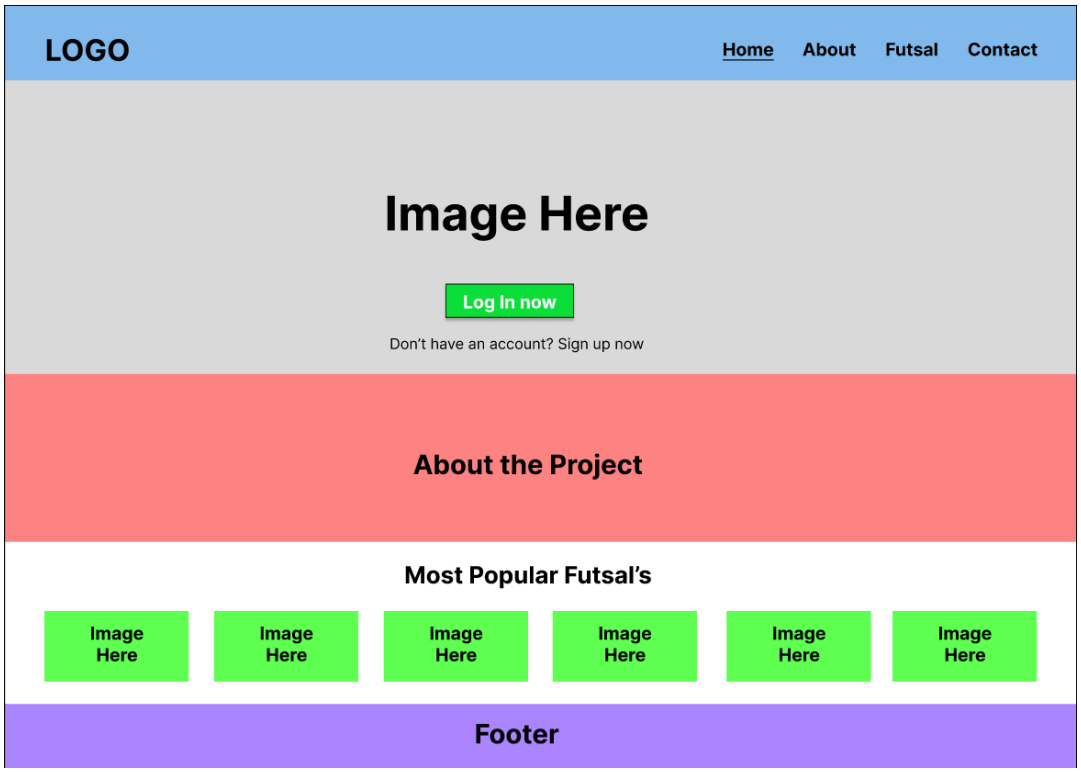
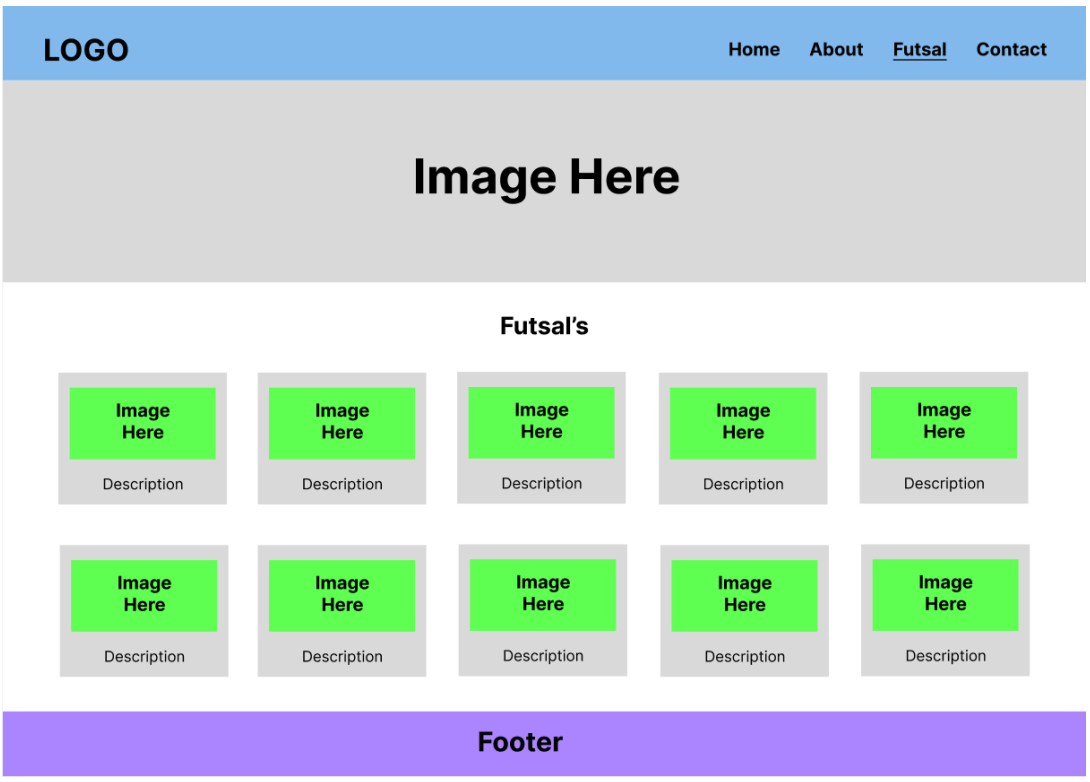


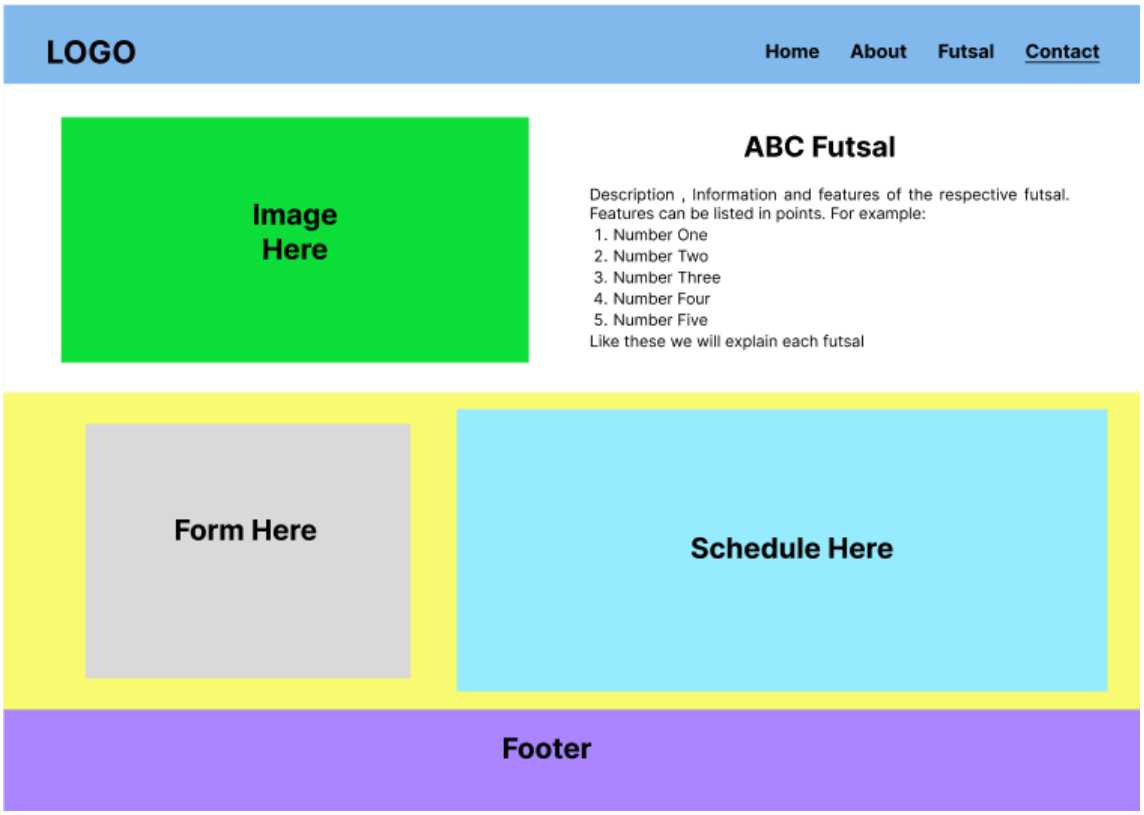
Figure 3.6: Database Schema of FMS

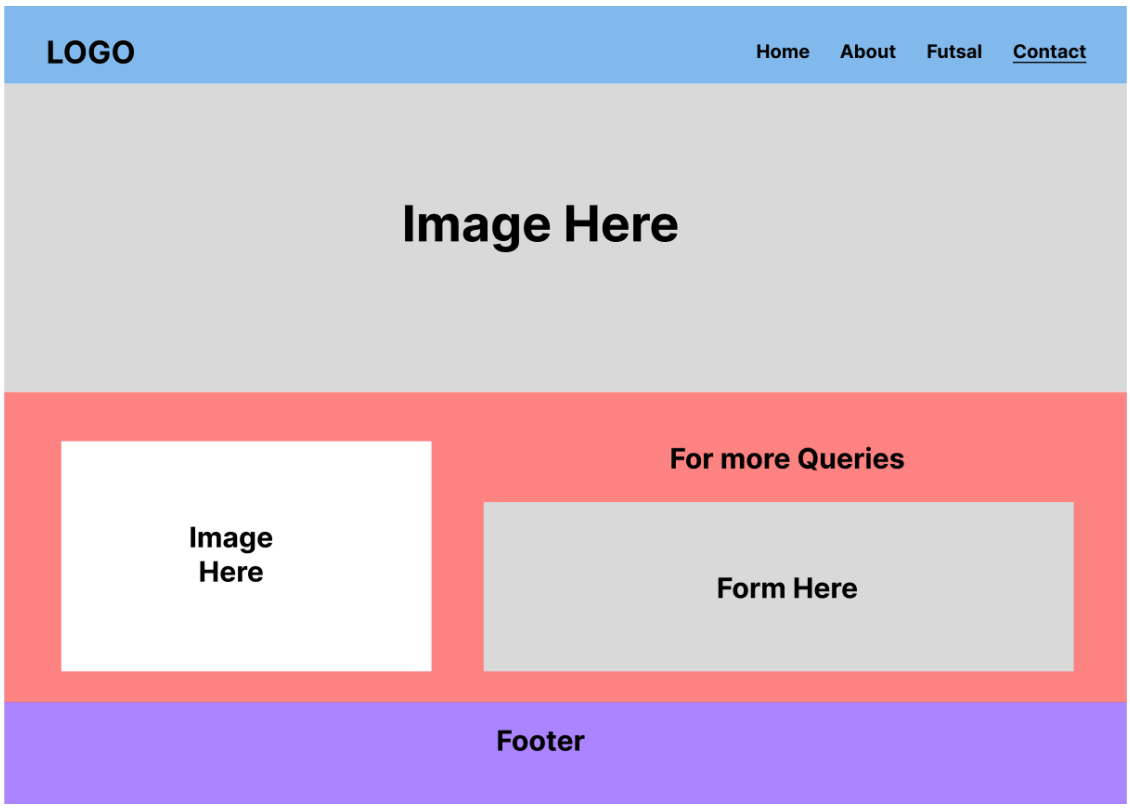
3.2.3. Interface Design

Interface design was made using Figma.






LOGO
Home
About
Futsal
Contact
Image Here
ABC Futsal
Description , Information and features of the respective futsal.
Features can be listed in points. For example:
1. Number One
2. Number Two
3. Number Three
4. Number Four
5. Number Five
Like these we will explain each futsal
Form Here
Schedule Here
Footer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About
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Image Here
Form Here
Footer

3.2.4 Physical DFD

Anyone can create accounts to access all the features of the application. And in the case of registered users, they can simply login with their login credentials and based on the system response they can access the system. After logging in they can book the futsal. Futsal owner can add and edit their futsal. As for admin, they can access the dashboard by entering the login credentials. Admin has features to change user role, change futsal status, view all data like payments, reservation, etc.

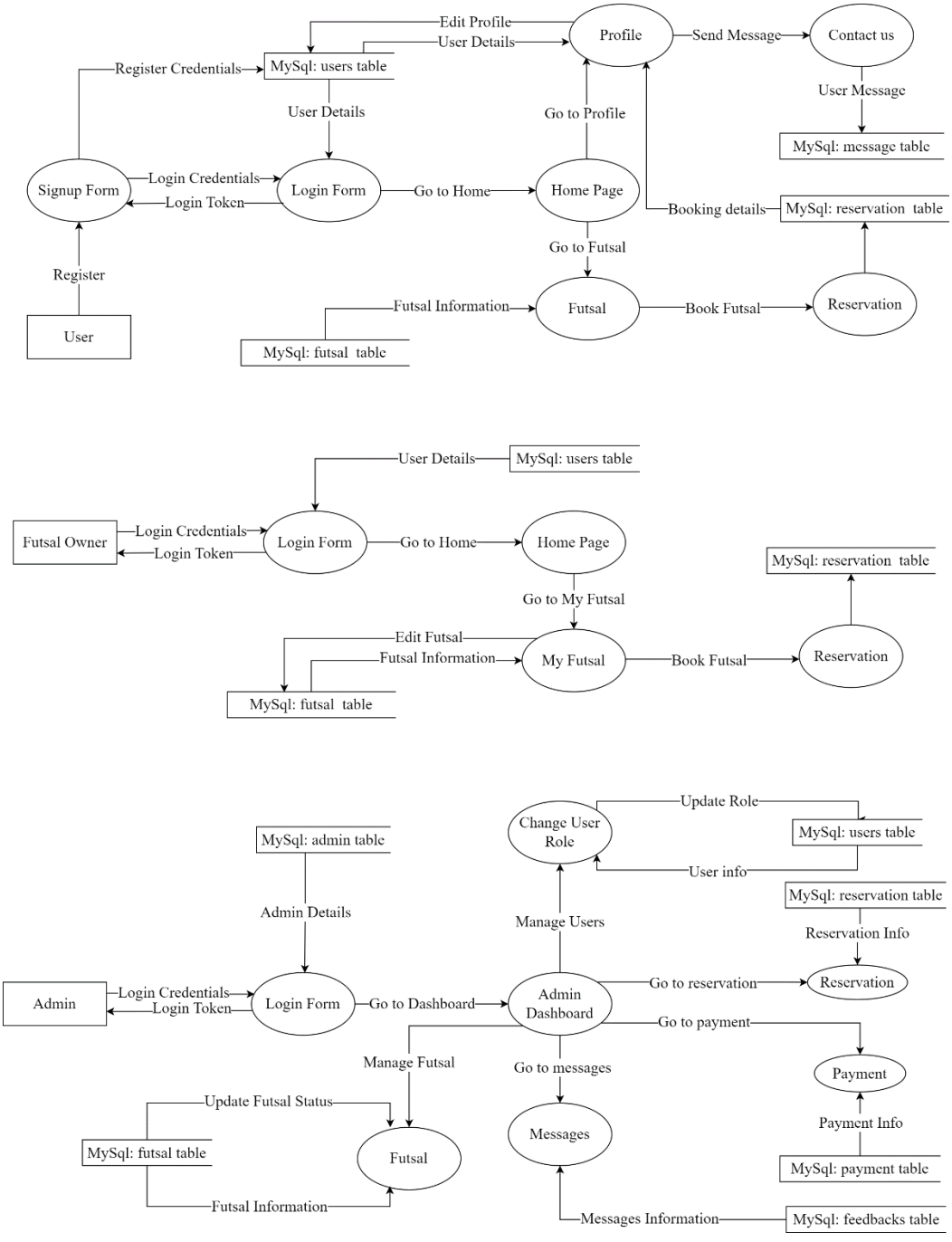

Figure 3.7: Physical DFD of FMS

3.3 Algorithm

Haversine algorithm is a mathematical formula used to calculate the distance between two points on the Earth's surface given their latitude and longitude coordinates. It is particularly useful for calculating the shortest distance between two points on a spherical surface, such as the Earth's surface, making it an important tool in geographic applications such as navigation, location-based services, and spatial analysis. [11]

To calculate the haversine algorithm for the location of two locations Point A (latitude 37.775, longitude -122.419) and Point B (latitude 40.7128, longitude -74.0060) you would follow these steps:

1. The Earth's radius (R) is approximately 6,371 kilometers (3,959 miles).
2. Point A: Latitude = 37.775°, Longitude = -122.419°
   Point B: Latitude = 40.7128°, Longitude = -74.0060°
   Convert these coordinates to radians using the formula: angle in radians = (angle in degrees) × (π / 180).
3. Δlat (Difference in Latitude) = (40.7128 - 37.775) radians
   Δlon (Difference in Longitude) = (-74.0060 - (-122.419)) radians
4. Calculate the Haversine of half of the central angle (θ) using the Haversine formula:
   $\text{haversin}(\theta) = \sin^2(\Delta\text{lat} / 2) + \cos(\text{lat1}) \times \cos(\text{lat2}) \times \sin^2(\Delta\text{lon} / 2)$
5. Find the central angle (θ) by taking the inverse sine (arcsin) of the Haversine value calculated in the previous step.
6. Calculate the great-circle distance (D) between Point A and Point B using the central angle and Earth's radius:
   $D = R \times \theta$

The calculated distance (D) represents the shortest distance between Point A and Point B on the Earth's surface, typically in kilometers or miles, depending on the units used for Earth's radius.

Haversine algorithm can be used in various projects where nearest location-based data is needed. Here's how algorithm has been implemented in a project to know the location:

i. **Earth's Radius:** Define the Earth's radius (R), which is approximately 6,371 kilometers or 3,959 miles, as a constant.
ii. **Convert Degrees to Radians:** Convert the latitude and longitude coordinates of the

two points from degrees to radians using the formula:

angle in radians = (angle in degrees) × (π / 180)

iii. **Calculate Differences in Latitude and Longitude:** Find the differences (delta) between the latitude (Δlat) and longitude (Δlon) values of the two points, representing angular separation.

iv. **Haversine Function:** Define the Haversine function as:

haversin(θ) = $\sin^2(\theta/2)$

v. **Haversine Calculation:** Calculate the Haversine of half of the central angle (θ) between the two points using the differences in latitude and longitude.

vi. **Inverse Haversine:** Find the actual central angle (θ) by taking the inverse sine (arcsin) of the Haversine value calculated in the previous step.

vii. **Great-Circle Distance:** Compute the great-circle distance (D) between the two points using the central angle and Earth's radius:

D = R × θ

viii. **Final Result:** The result is the shortest distance between the two points, often expressed in kilometers or miles, depending on the units used for Earth's radius. [12]

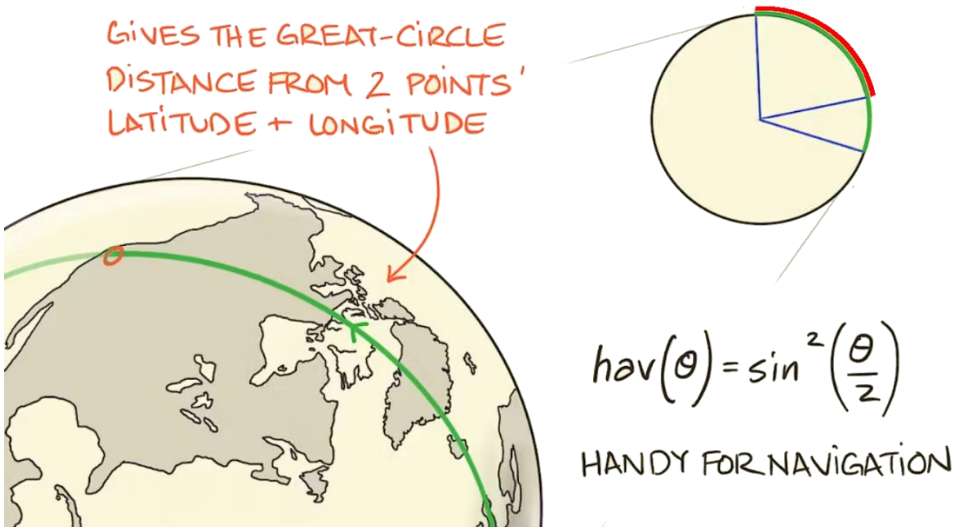

Figure 3.8: Haversine algorithm working process

In this picture, locations were chosen to determine the distance between them (i.e., B and C) and the user location (i.e., A). The distance to that location is measured one by one using the haversine formula. After measuring the distance with this method $\sin^2(\Delta lat / 2)$, arrange them in a list so that it is clear which is close and which is far. A curve A to B in the above graphic represents the closest location to the user, while a curve A to C indicates the farthest location from the user.

CHAPTER 4 :

IMPLEMENTATION AND TESTING

4.1. Implementation

4.1.1. Tools Used (CASE tools, Programming language, Database platforms)

Tools Used

The various system tools that have been used in developing both the frontend and the backend of the project are being discussed in this chapter.

FRONT END

Photopea, React, Bootstrap, Figma are utilized to implement the frontend.

Photopea | Online Photo Editor

Photopea is an online version of Photoshop which is used to edit photos in the project. This is used to edit many photos to fit in some places and also used to design logos.

React

React is a powerful JavaScript library used in web development to create interactive and dynamic user interfaces. In this project, react played a vital role in building the client-side of this system. It enabled the development of responsive and user-friendly web pages, facilitating features like browsing futsal courts, making bookings, and managing users.

Bootstrap

Bootstrap is a popular front-end framework that provides a collection of pre-designed and responsive CSS and JavaScript components. In this system, bootstrap helped in streamline design process, making it faster and more efficient. Bootstrap's grid system, responsive classes, and UI components, which create a seamless and visually pleasing experience for the users across different devices and screen sizes. the users.

Figma

Figma is a powerful design and prototyping tool that was crucial during the project's design phase. It is a collaborative design and prototyping tool that played a vital role in our project's design phase. It allowed real-time previews, and prototyping, ensuring our futsal booking system's visual aspects met our objectives.

BACKEND

The back end is implemented using MySQL which is used to design the databases.

Java Spring Boot

Spring Boot acts as our project's handy toolbox, simplifying the development process by providing pre-built solutions for setting up a web server and connecting to a database, saving us from writing extensive code from scratch. Hibernate serves as a bridge between our application and the database, making it effortless to store and retrieve data without diving into complex database operations. Meanwhile, Maven operates as our project's diligent manager, keeping our libraries and dependencies organized and ensuring we have all the necessary tools at our disposal. Together, these technologies streamline the development of our futsal booking system, allowing us to focus on delivering a seamless and efficient user experience.

MySQL 8.0.22

MySQL is the world's second most widely used open-source relational database management system (RDBMS). The SQL phrase stands for Structured Query Language. MySQL is used to store all the data of project.

Other Tools used

Git and GitLab

GitLab proves to be a robust platform for source code management, offering a suite of valuable features such as version control, issue tracking, and continuous integration. While it's designed for collaborative work, its versatility makes it equally beneficial for single developers also. It allows to effectively manage project's version history, keep tabs on tasks and milestones, and maintain an organized development workflow. Safeguarding the code, documenting changes, or monitoring the project's progress, GitLab serves as an all-encompassing tool.

Draw.io

Draw.io is a free and open-source cross-platform graph drawing software developed in HTML5 and JavaScript. Its interface can be used to create diagrams such as flowcharts, wireframes, UML diagrams, organizational charts, and network diagrams.

4.1.2. Implementation Details of Modules (Description of procedures/functions)

For admin

- **Admin manage futsal**

  Admin can click on manage futsal for managing the futsal information. Admin gets the brief information about each futsal and can change the status of futsal available or unavailable which will show/hide the futsal from the user's interface.

- **Admin monitor booking**

  Admin can also monitor the bookings where they can get to see all the booking information. Admin can get information of which customer is reserving which futsal for how long along with customer information, total cost and status of the booking.

- **Admin manage users**

  Admin has managed user's option to manage users. A user can be customer or futsal owner. Admin can get detailed information of the user and based on that information admin can change the role of user and delete the user permanently. User can only place the reservation of the futsal which is made by the futsal owner.

- **Admin monitor payment**

  Admin can monitor the payment through monitor payment. From here admin can get the full information of payment status of each booking of futsal.

- **Admin manage contact us**

  The application is used by many people. Some people may have some questions, suggestions, opinion, complaints etc. All these messages given to system is managed by admin through manage contact us. From here admin can view each message and can do follow up reply to those queries.

For user (Futsal Owner)

- **Add Futsal**

  Futsal owner can add futsal to the system. To add futsal, first the user has to be registered in this system. Then s/he has to communicate with admin so that they can be owner and add their futsal in the system. After this, they are ready to add their futsal

through their account and add the futsal information. After posting the data, user's (customers) can view the futsal post in their futsal page. Now, user can select the futsal, and book the futsal according to their suitable time. User has to provide all the required data with payment process to reserve futsal.

- **Edit futsal**

  Futsal owner can view their futsal through my futsal option, which can be found after clicking the top-right user name. After clicking the futsal, the futsal owner can view the details of the futsal along with update option. Futsal owner can click update option to update the futsal which will prompt to update form and after updating the futsal it can be viewed by all the users using this system.

- **Manage booking**

  Any reservation made by customer for the futsal is visible to futsal owner through the timeline of futsal. From here futsal owner can view the reservations made by user and can also see the history of booked futsal. Futsal owner can also get details of duration of reservation, date and time, location, total cost etc. Futsal owner can also see the payment options from payment method is done and confirm the status of payment.

For user (customers)

- **Create booking**

  Users can make reservations to any available futsal with the suitable period of time. For booking any futsal first, the user should have created user profile and provide adequate data. After that the user can make reservation for the futsal on the available date and time. After the reservation has been placed the user had to choose the payment process to book the futsal.

- **Making payments**

  By choosing the futsal with favorable date and time, the user press Book now button. After pressing that payment, the available payment options are cash and online payment. If the online payment option has been clicked user gets the QR code to scan and also bank details with other information to make online payment to any of them and has to upload the payment file for verification. After making payment the booking is confirmed.

Signing up

Any user can sign up to the system. User can register by filling up the sign-up form by giving required and adequate data. After the user has been registered the user can use the e-mail id and password to login in to the system.

Login

Admin and user can log in to the system, after entering the correct username/e-mail id and passwords.

4.2. Testing

Different training and testing datasets are provided throughout system testing. The purpose of this test is to determine whether or not the system is delivering correct summaries. Our system is continually tested while it is still in the development phase. The various tests carried out are as follows:

4.2.1. Test Cases for Unit Testing

Registration test case

Table 4.1: Registration test case

ID	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	User forgets to input first name and last name field.	First name = Last name =	Display error message ‘First name and Last name is required’ and prevent form submit.	As expected	Pass
2	User forgets to input E-mail field.	Email =	Display error message ‘E-mail is required’ and prevent form submit.	As expected	Pass
3	User inputs duplicate E-mail	Email = rajesg@gmail.com	Display error message ‘Request Failed’ and prevent form submit.	As expected	Pass

4	User forgets to input Phone number field.	Phone number =	Display error message ‘Phone number is required’ and prevent form submit.	As expected	Pass
5	User forgets to input Address field.	Address =	Display error message ‘Address is required’ and prevent form submit.	As expected	Pass
6	User forgets to input latitude and longitude field.	Latitude = Longitude =	Display error message ‘latitude and longitude is required’ and prevent form submit.	As expected	Pass
7	User inputs different password and confirm password value	Password = Aa12345# Confirm password = 12345678	Display password and confirm password doesn’t match.	As expected	Pass
8	User inputs all the data as required	First name = Jay Last name = Rai Email= jay@gmail.com Address = Ktm Phone = 9841971529 Longitude = 86.1232 Latitude = 82.1215 Password = Ab@1 Confirm password = Ab@1	Display account created successfully in an alert box	As expected	Pass

Login test case

Table 4.2: Login test case

ID	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	User forgets to input email field.	E-mail = Password = 12345	Display error message 'Email is required' and prevent form submit.	As expected	Pass
2	User forgets to input password field.	E-mail = rajesh@gmail.com Password =	Display error message 'Password is required' and prevent form submit.	As expected	Pass
3	User provides invalid e-mail and password information.	E-mail = abc@gmail.com Password = 1234567	Display error message 'E-mail or password is not correct. Please try again' and prevent login.	As expected	Pass
4	User provides valid information.	E-mail = rajesh@gmail.com Password = 12345	User is logged in and redirected to home screen of the system.	As expected	Pass

Admin login

Table 4.3: Admin login test case

ID	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	Input invalid	Username =	Alert 'Invalid	As	Pass

	Email or Password.	admin@gmail.com Password = 123456789	details' and prevent login.	expected	
2	Input valid username and password	Username = adi@gmail.com Password = 12345	Login successfully and redirect to dashboard.	As expected	Pass

Test case for adding futsal

Table 4.4: Adding futsal test case

ID	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	Futsal owner forgets to input Futsal name field.	Futsal Name =	Display error message 'Futsal name is required'	As expected	Pass
2	Futsal owner forgets to input E-mail field.	E-mail =	Display error message 'E-mail is required'	As expected	Pass
3	Futsal owner forgets to input Address field.	Address=	Display error message 'Address is required'	As expected	Pass
4	Futsal owner forgets to input Contact No. field.	Contact No. =	Display error message 'Contact is required'	As expected	Pass
5	Futsal owner forgets to input Opening Time and Closing Time.	Address =	Display error message 'Opening Time and Closing Time is required'	As expected	Pass
6	Futsal owner forgets to input Description.	Description =	Display error message 'Description is	As expected	Pass

			required’		
7	Futsal owner forgets to input Features.	Features =	Display error message ‘Features is required’	As expected	Pass
8	Futsal owner forgets to input Latitude and Longitude.	Latitude = Longitude =	Display error message ‘Latitude and Longitude is required’	As expected	Pass
9	Futsal owner forgets to upload images	Images =	Display error message ‘Images are required’	As expected	Pass

Test case for update futsal

Table 4.5: Update futsal test case

ID	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	Futsal owner forgets to input Futsal name field.	Futsal Name =	Display error message ‘Futsal name is required’	As expected	Pass
2	Futsal owner forgets to input E-mail field.	E-mail =	Display error message ‘E-mail is required’	As expected	Pass
3	Futsal owner forgets to input Address field.	Address=	Display error message ‘Address is required’	As expected	Pass
4	Futsal owner forgets to input Contact No. field.	Contact No. =	Display error message ‘Contact is required’	As expected	Pass
5	Futsal owner forgets to input Opening Time	Address =	Display error message ‘Opening Time and Closing	As expected	Pass

	and Closing Time.		Time is required’		
6	Futsal owner forgets to input Description.	Description =	Display error message ‘Description is required’	As expected	Pass
7	Futsal owner forgets to input Features.	Features =	Display error message ‘Features is required’	As expected	Pass
8	Futsal owner forgets to input Latitude and Longitude.	Latitude = Longitude =	Display error message ‘Latitude and Longitude is required’	As expected	Pass

Test case for reservation

Table 4.6: Reservation test case

ID	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	User forgets to input any date and time	Date = Time =	Display error message	As expected	Pass
2	User provide starting date older than today’s date	Date = 2023/06/26 (Current date : 2023/06/28)	Display error message ‘Please insert valid month’	As expected	Pass
3	User try to book the futsal which is already booked by another user	Time = (Want to book 4PM – 5PM, but already booked by other)	The specific time won’t be shown in dropdown list	As expected	Pass
4	User provides all the accurate data.	Date = 2023/07/02 Time = 6PM – 7PM	Booked and redirect to payment page.	As expected	Pass

4.2.2 Test case for System Testing

User reservation process

Table 4.7: User reservation test case

S. N.	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	User log in to the system.	E-mail = rajesh@gmail.com Password = 12345	User is logged in and redirected to home screen of the system.	As expected	Pass
2	User select the futsal from the list	Select the Futsal and click on view button	Open the Futsal page where all details are stored	As expected	Pass
3	User select the correct date and time reserve a futsal.	Date = 2023/07/02 Time = 6PM – 7PM	Reserved futsal will be added to user's profile in timeline with the reservation status Booked	As expected	Pass
4	User select the online payment method and provides all the necessary files.	Option selected: Online payment File updated: paymentfile.pdf	Book the futsal and show the payment to futsal owner	As expected	Pass

Futsal Owner Reservation Management

Table 4.8: Futsal Owner reservation test case

S.N.	Test Case Description	Test Data	Expected Output	Actual Output	Result
1	Futsal owner clicks on my futsal to see	Click on profile then Futsal button	User is redirected to my	As expected	Pass

	the booked futsal and to see history	which drops down after hover the profile area on the top-right corner.	futsal page.		
2	Futsal Owner can see the timeline where all details of user with booking time can be seen.	Click on my futsal button and scroll down to see the timeline	User details with payment method, date and time can be seen.	As expected	Pass
3	Futsal Owner views the payment details.	Click on the payment method option to see the document			
4	Futsal Owner can book their own futsal when another user came to book remotely.	Click on my futsal page and go to Booking section Date = 2023/07/02 Time = 6PM – 7PM	Reservation is completed when proper data is recorded	As expected	Pass

CHAPTER 5 :

CONCLUSION AND FUTURE RECOMMENDATIONS

5.1. Conclusion

In conclusion, the Futsal Management System (FMS) has emerged as a transformative solution for the efficient management of futsal court operations. It has successfully addressed all project objectives, serving as a user-friendly platform for customers to seamlessly reserve futsal courts online. The system's robust payment processing capabilities ensure secure transactions and provide users with immediate receipts, enhancing trust and convenience in the booking process. Simultaneously, the FMS offers a real-time snapshot of court availability, features, and schedules, enabling owners to make informed decisions and optimize their business operations through data-driven insights. With the added benefit of an integrated navigation system, customers can easily find nearby futsal courts, simplifying their overall experience and increasing accessibility to the sport.

Ultimately, the FMS has not only met but exceeded expectations by delivering a comprehensive and efficient solution for futsal court users and owners alike. Its user-friendly interface, secure payment processing, and insightful reporting have elevated the standards of futsal court management. By bridging the gap between customers and owners, the FMS has not only streamlined operations but also contributed to improved profitability and customer satisfaction, making it an invaluable asset to the futsal community.

5.2. Lesson Learnt / Outcome

The result is more worthwhile when the dedicated effort is made. In this project there was very limited knowledge and completing it with a good understanding of coding practices and problem-solving skills. We learnt a variety of problem-solving techniques as well as independent problem-solving, appropriate use of guidelines and writing abilities. While doing this project, I've learnt various good coding practices. I've gained a great deal of problem-solving skills from working on this project, as well as the ability to identify and fix various faults that could emerge in the system. Learnt how to create proposals and project-related documentation, as well as how to use various case tools like use case diagrams, schema diagrams, data flow diagrams, and ER diagrams, among others. The most significant lesson was how to prioritize system components based on their complexity and

manage time accordingly. This project made me think wide and broad, and taught us creativity is also needed.

5.3. Future Recommendations

This project is just at its beta phase. There are lots of shortcomings and many improvements to come. With proper techniques and methodologies, we can see lots of new features and functionality added to the application. Some places for improvements are:

- Efficient way to locate your exact location
- Rating and Reviews
- Third party API for payment options

Learning new things is never ending process, with each experience a perfect diamond is formed.

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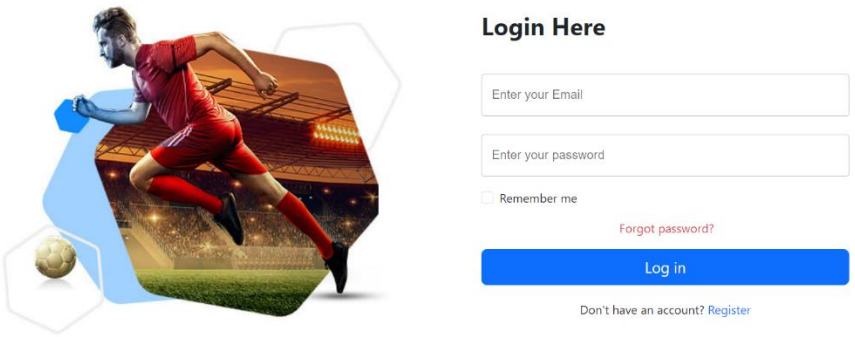
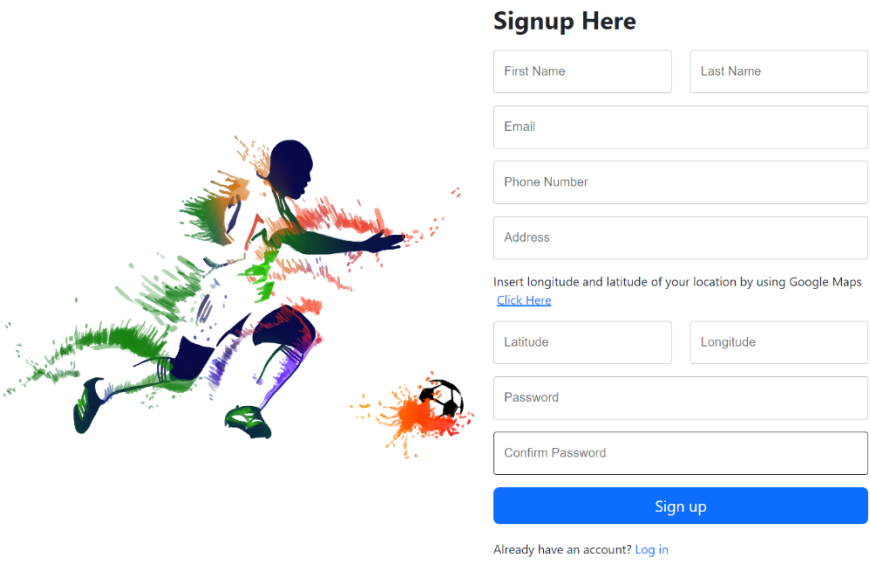
APPENDIX: SYSTEM SCREENSHOTS

Login page



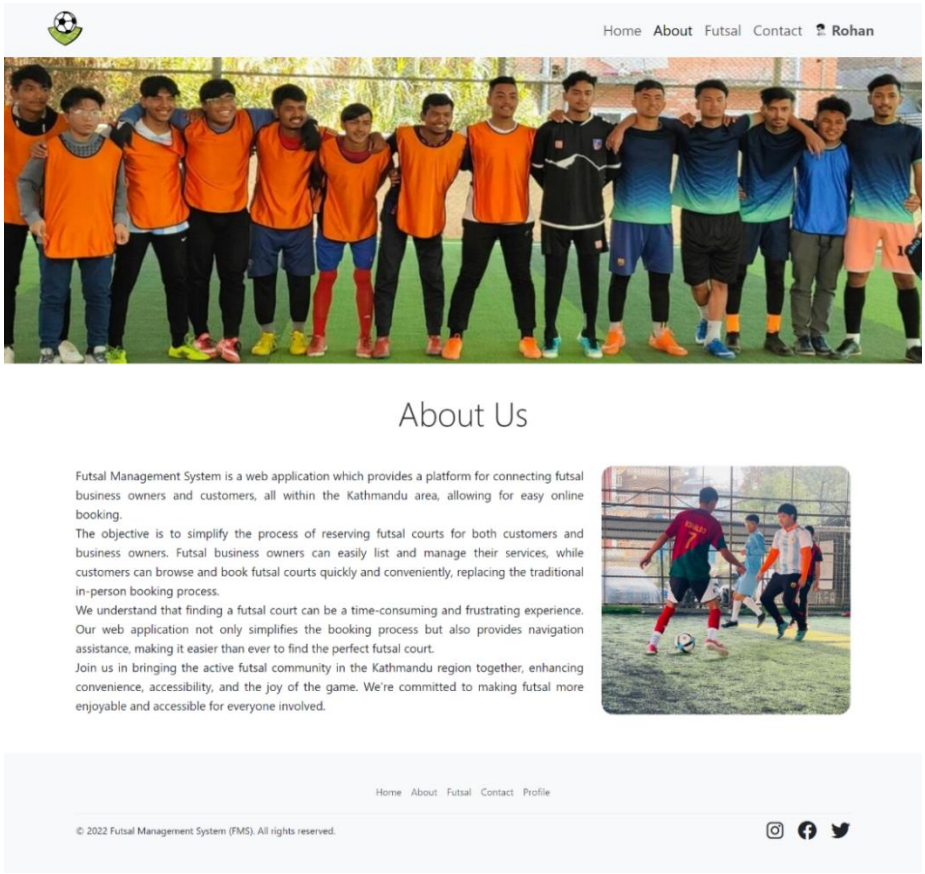
Signup page



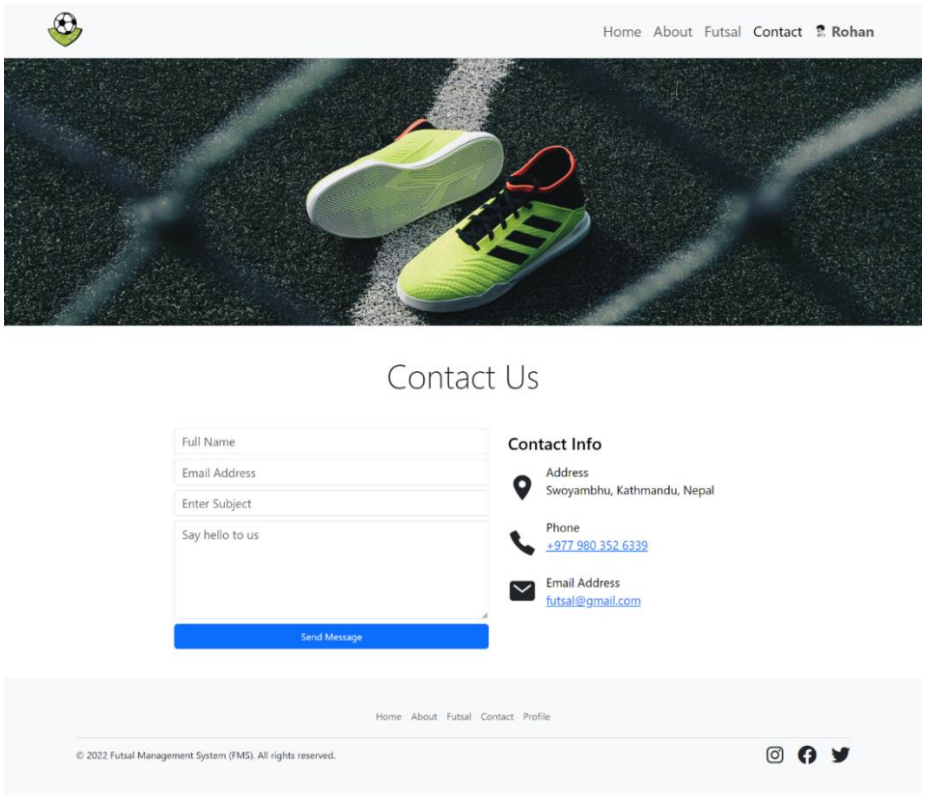
Home


Home About Futsal Contact Rohan
Welcome to Futsal Booking Site
Futsal is a variant of soccer that is played indoors on a smaller field with reduced number of players per team. This web application provides varieties of futsal located inside Kathmandu area which can be booked through online.
This is an online booking webpage which makes it simple for customers to reserve the futsal they want for the time that works best for them. The futsal business owner can easily list and manage all of their varied services here.
What we Have
Numerous Futsals
In this site, there are many futsals which you can book anytime
Book your Futsal
You can book any futsal at any time according to your wants
Simple to Pay
Tansaction process is very easy as we provide different payment method
Easy Booking
Booking is so easy, by just choosing the futsal you can reserve futsal
About Us
This site is an online booking tool created to make it simple for customers to reserve the futsal they want for the time that works best for them. The futsal business owner can easily list and manage all of their varied services here. Customers who are interested in booking futsal can browse all of the alternates and book the futsal easily on short period of time.
Home About Futsal Contact Profile
© 2022 Futsal Management System (FMS). All rights reserved.

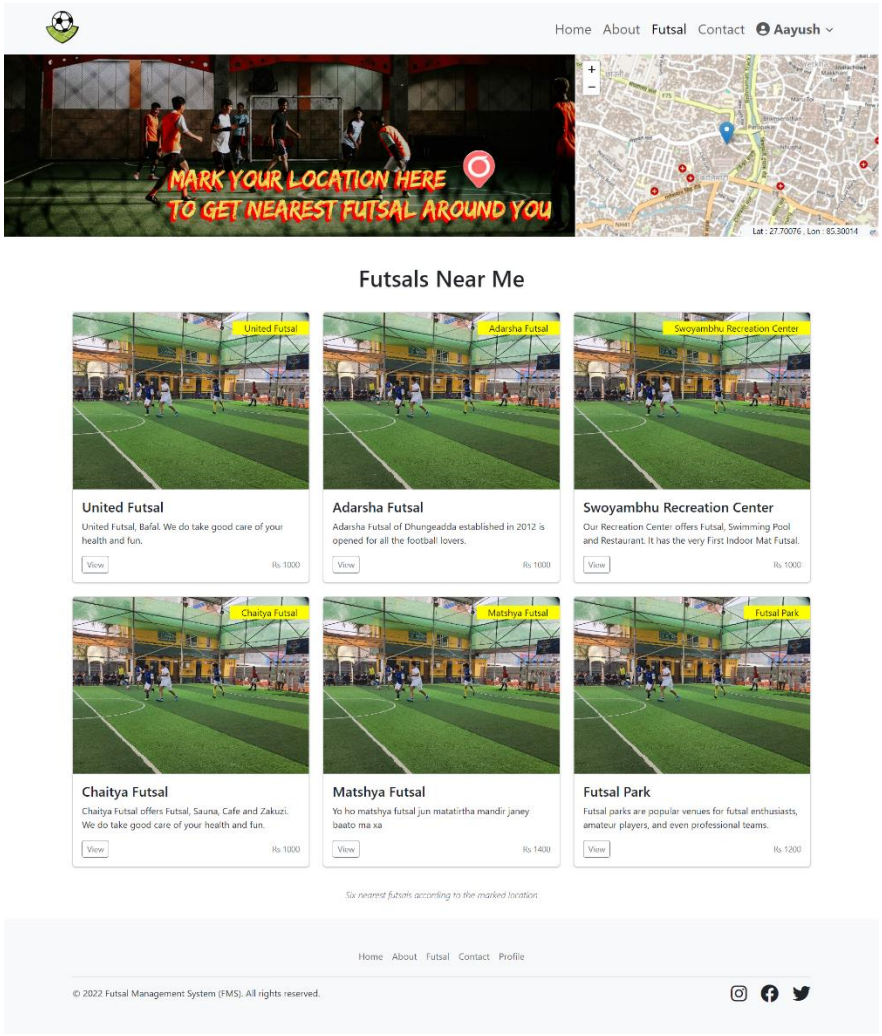
About



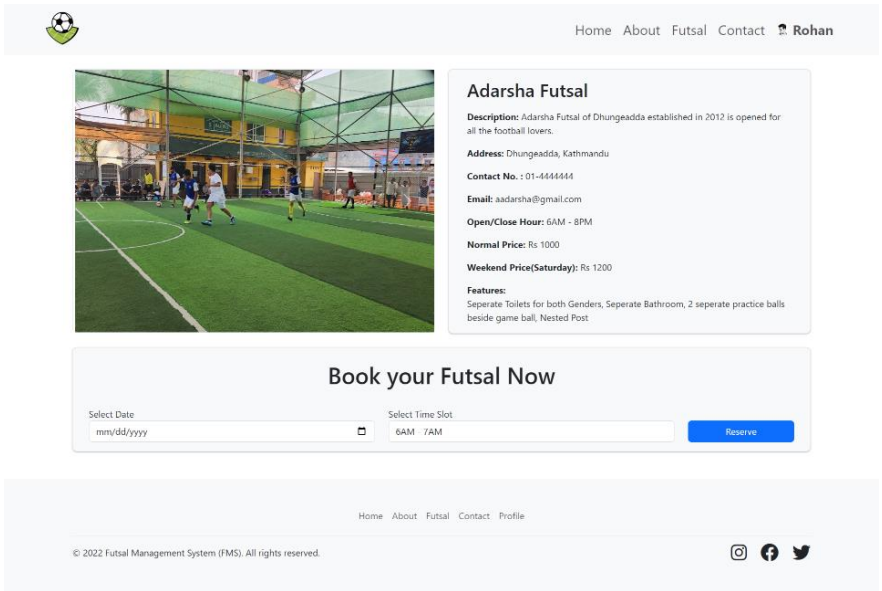
Contact



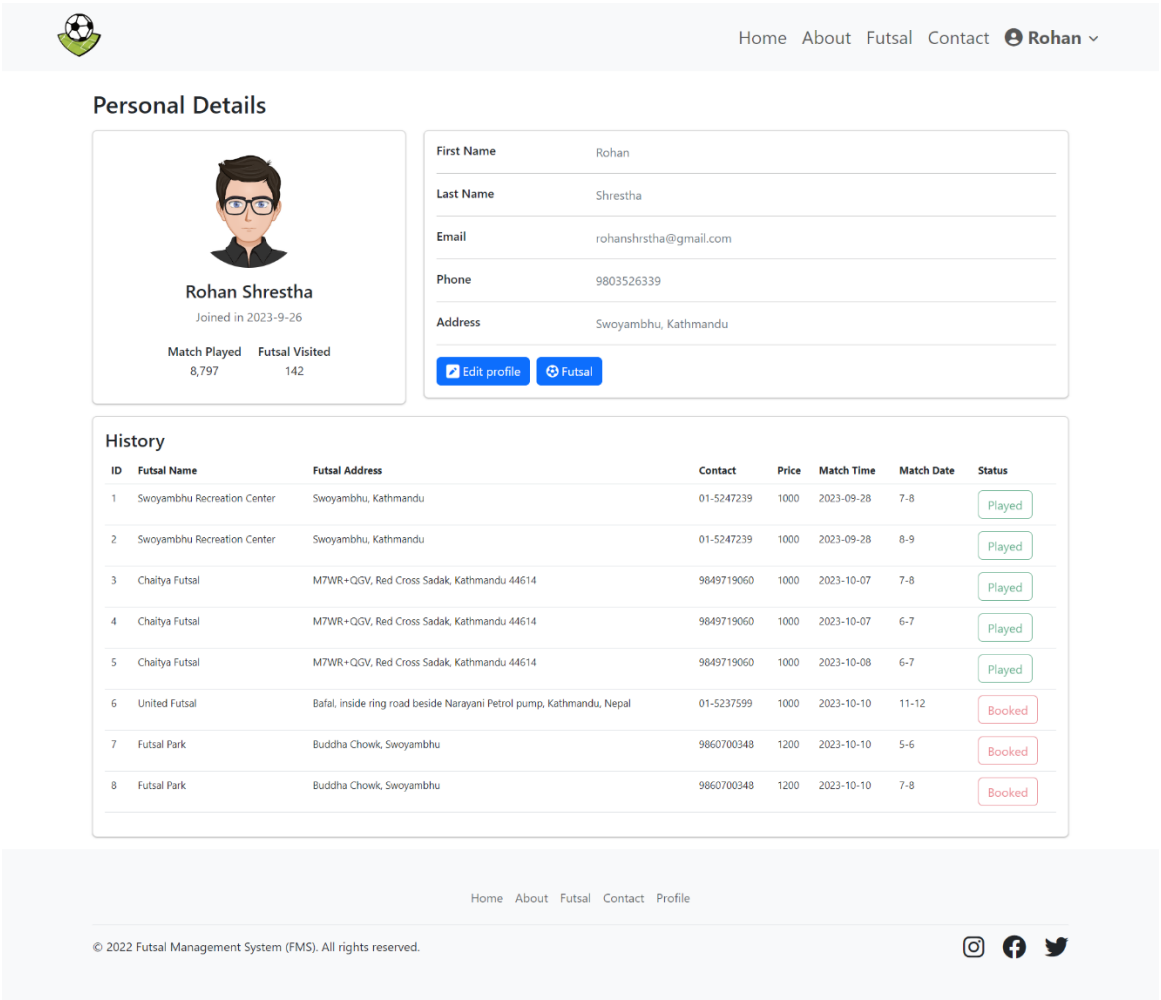
Futsal



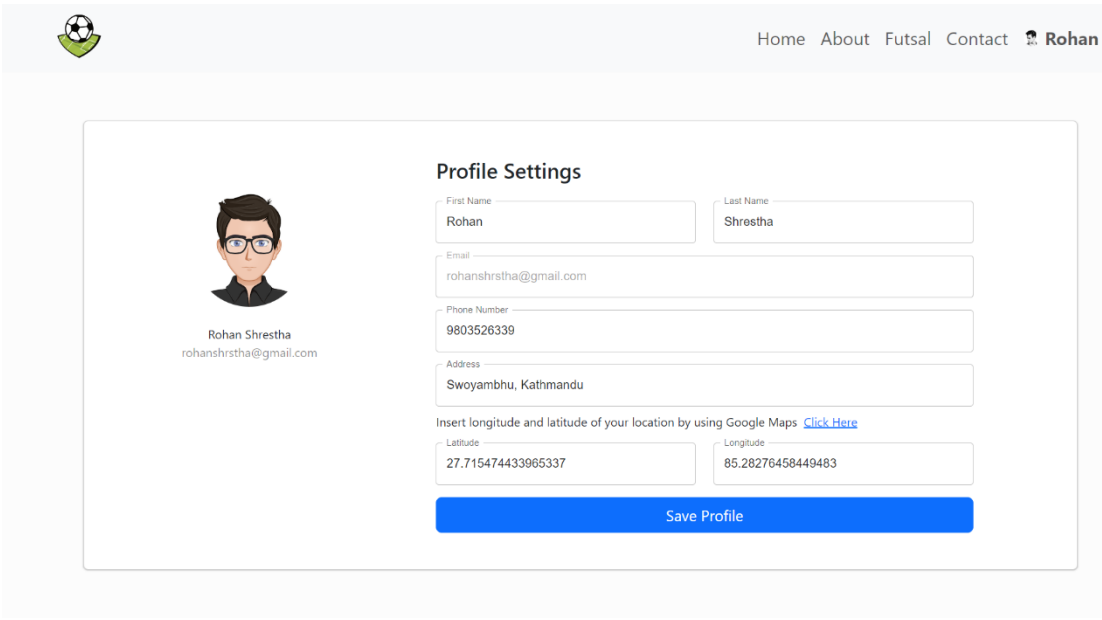
Futsal Content



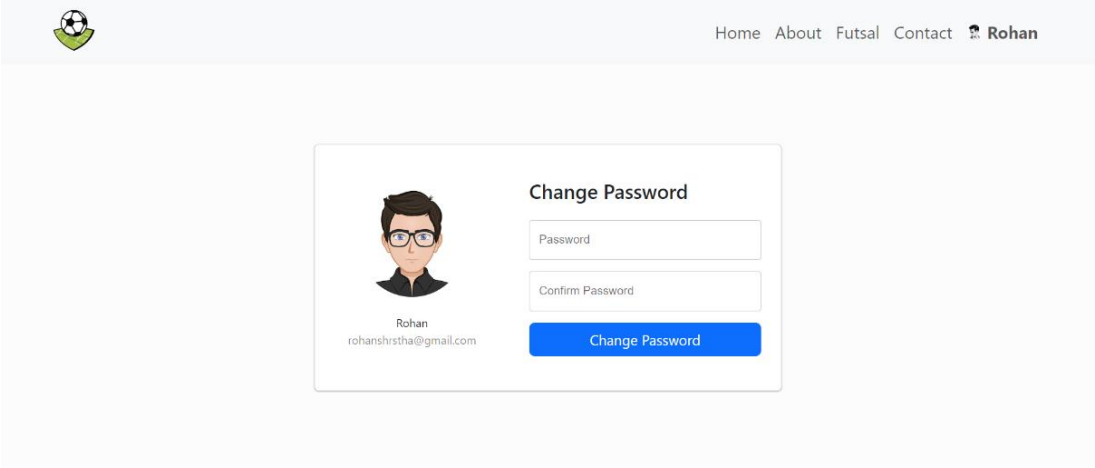
User Profile



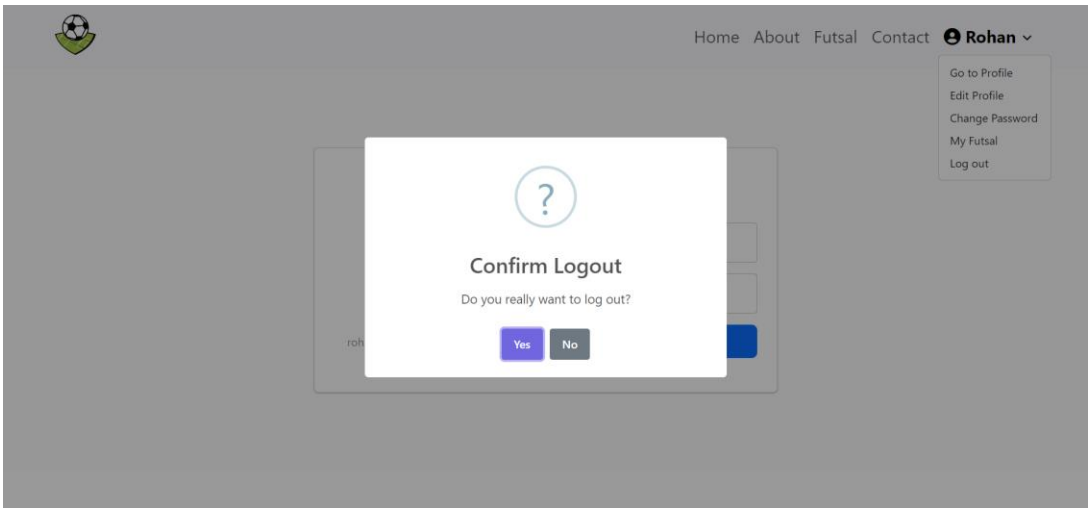
Edit Profile



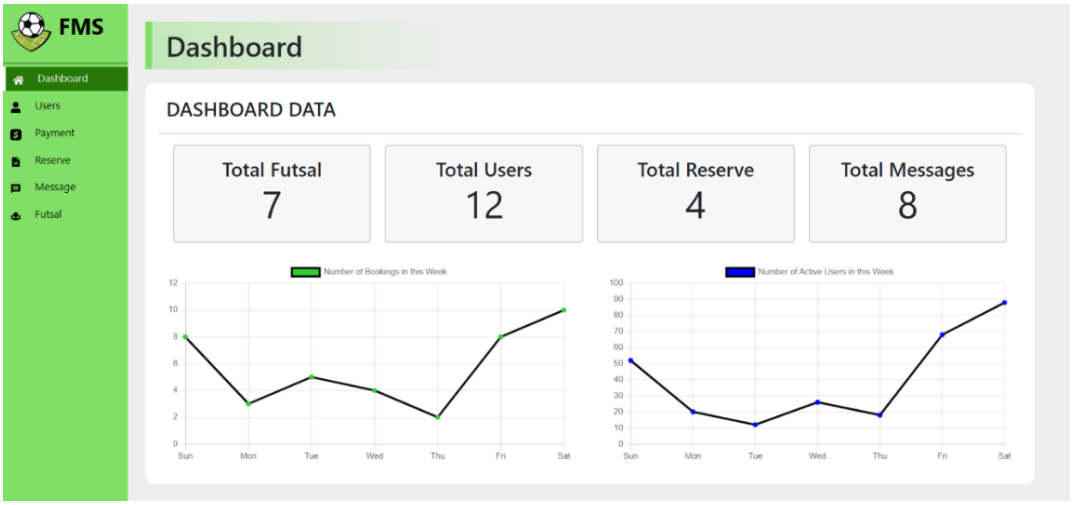
Change Password



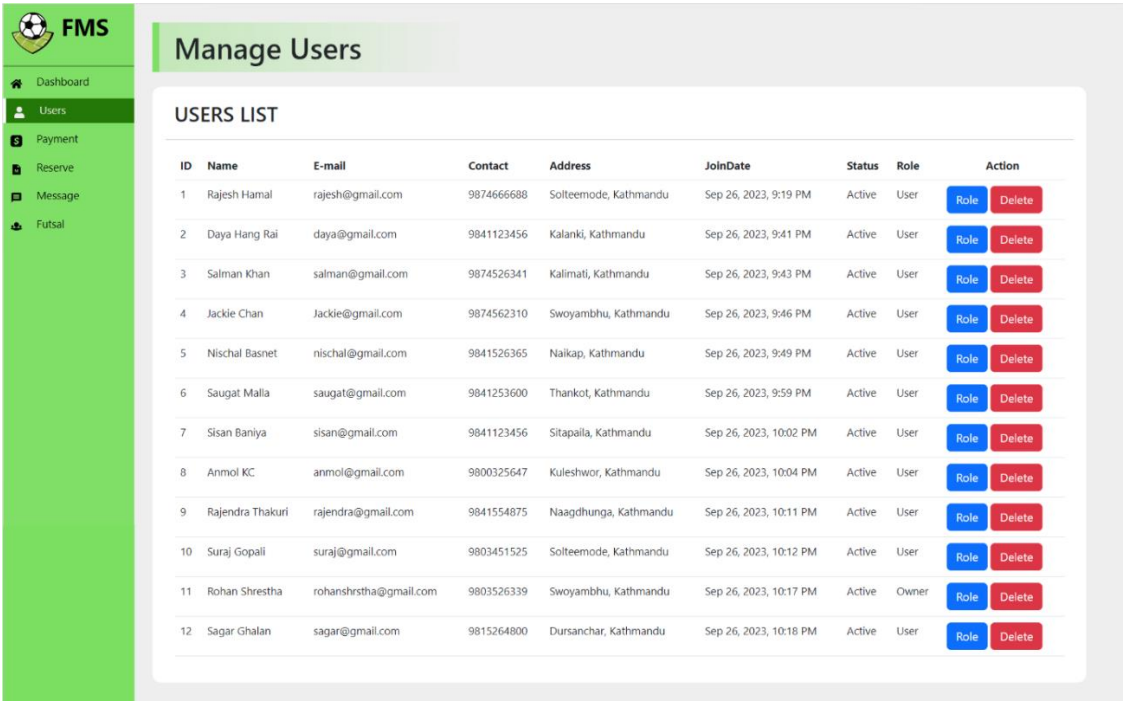
Log Out



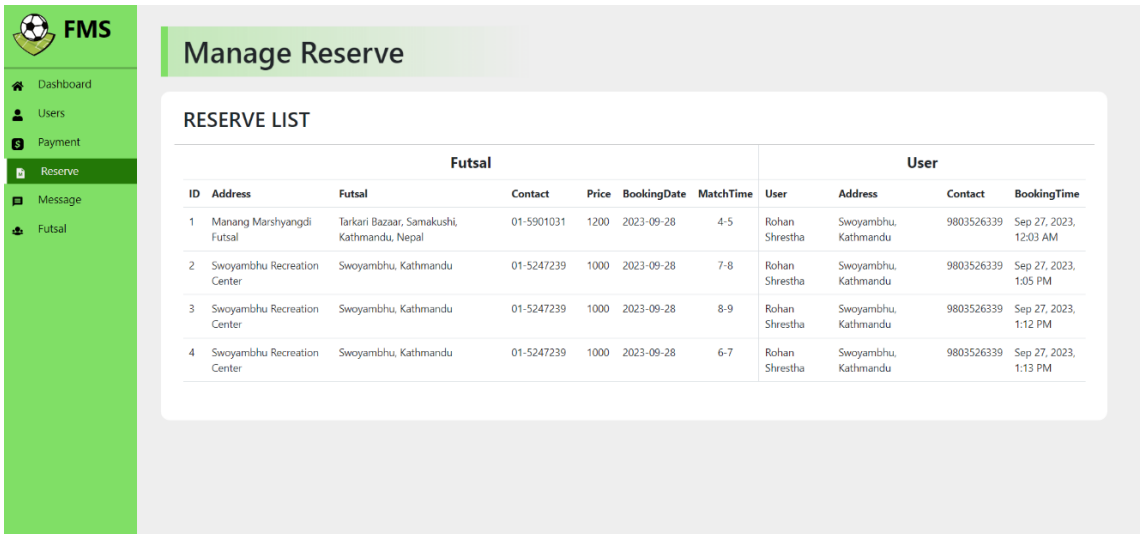
Admin dashboard



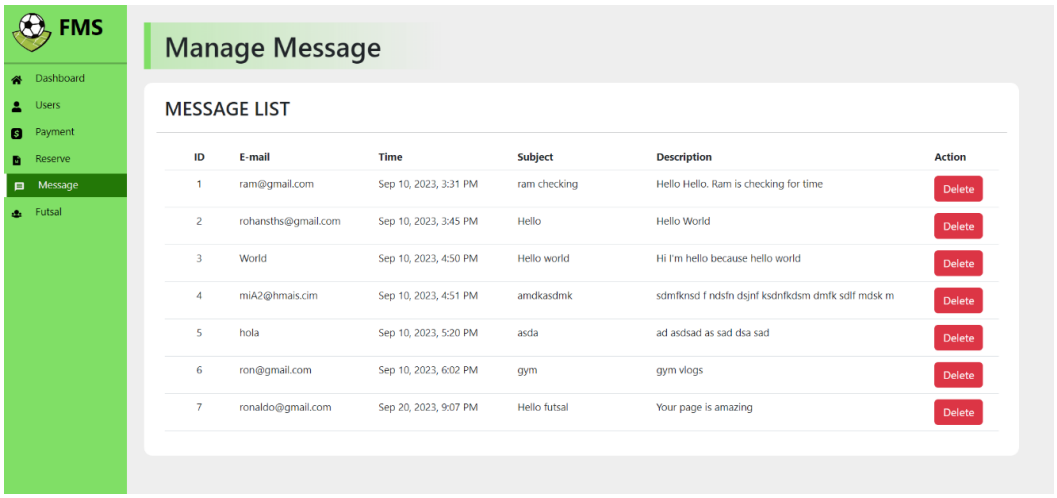
Admin Manage Users



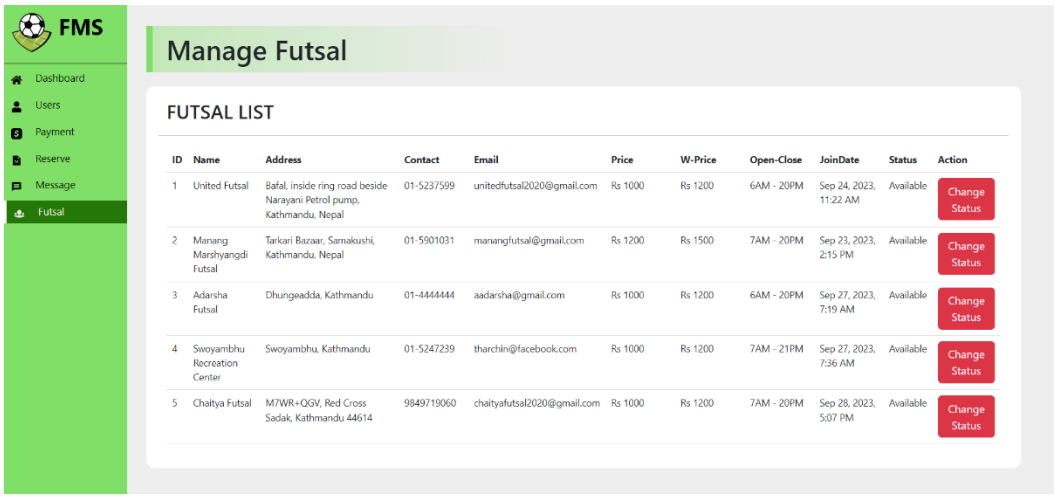
Admin Manage reserve



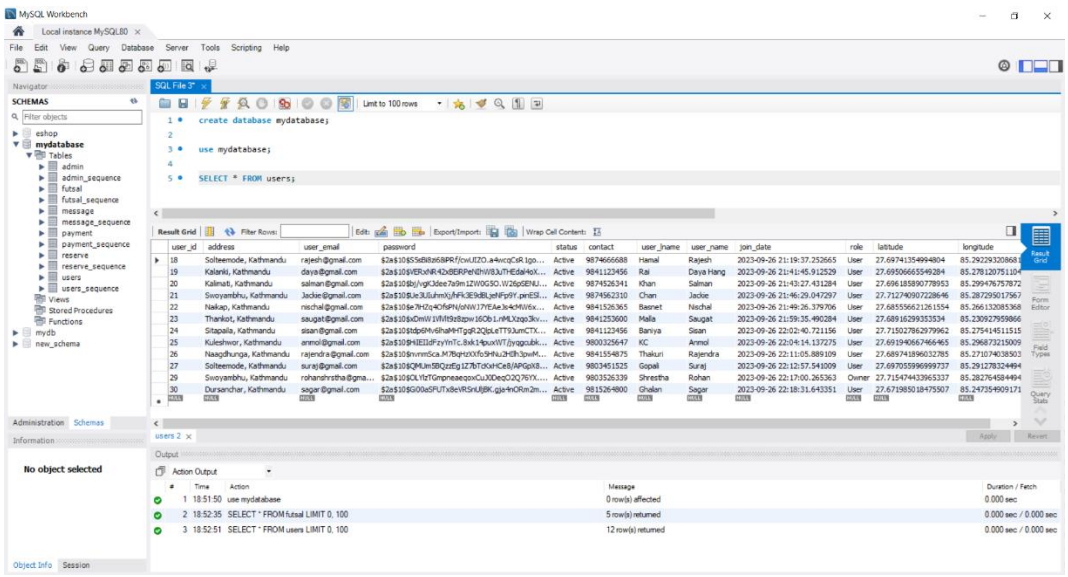
Admin Manage Message



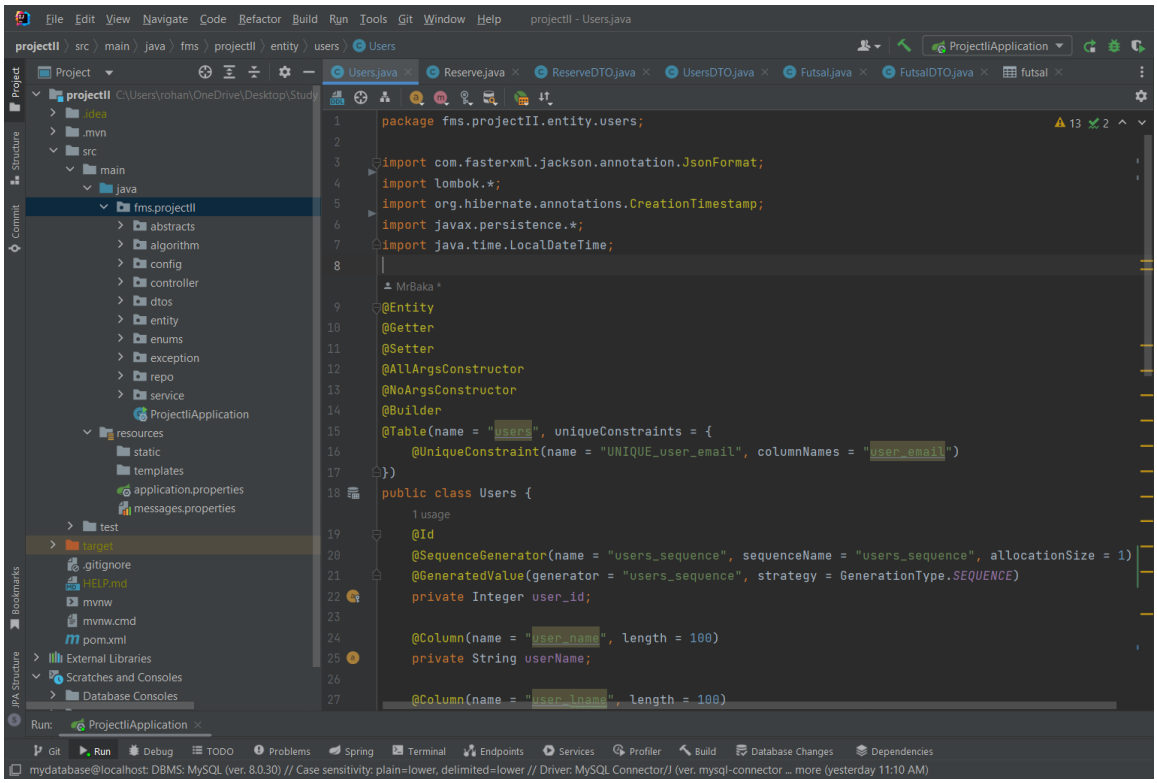
Admin Manage Futsal



System database overview

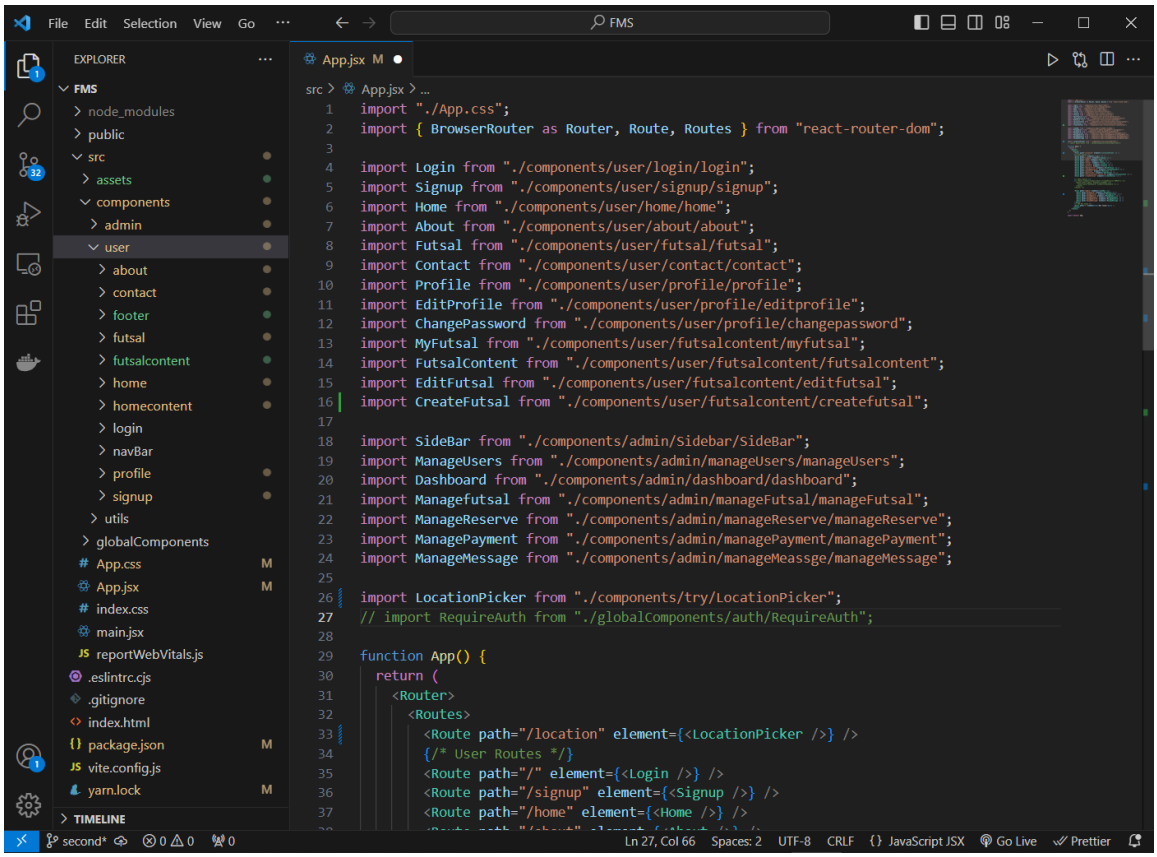


Backend Program in Spring Boot



```
package fms.projectII.entity.users;

import com.fasterxml.jackson.annotation.JsonFormat;
import lombok.*;
import org.hibernate.annotations.CreationTimestamp;
import javax.persistence.*;
import java.time.LocalDateTime;

@Entity
@Getter
@Setter
@AllArgsConstructor
@NoArgsConstructor
@Builder
@Table(name = "users", uniqueConstraints = {
    @UniqueConstraint(name = "UNIQUE_user_email", columnNames = "user_email")
})
public class Users {
    @Id
    @SequenceGenerator(name = "users_sequence", sequenceName = "users_sequence", allocationSize = 1)
    @GeneratedValue(generator = "users_sequence", strategy = GenerationType.SEQUENCE)
    private Integer user_id;

    @Column(name = "user_name", length = 100)
    private String userName;

    @Column(name = "user_lname", length = 100)
```

Frontend Program in React



```
import "./App.css";
import { BrowserRouter as Router, Route, Routes } from "react-router-dom";

import Login from "./components/user/login/login";
import Signup from "./components/user/signup/signup";
import Home from "./components/user/home/home";
import About from "./components/user/about/about";
import Futsal from "./components/user/futsal/futsal";
import Contact from "./components/user/contact/contact";
import Profile from "./components/user/profile/profile";
import EditProfile from "./components/user/profile/editprofile";
import ChangePassword from "./components/user/profile/changepassword";
import MyFutsal from "./components/user/futsalcontent/myfutsal";
import FutsalContent from "./components/user/futsalcontent/futsalcontent";
import EditFutsal from "./components/user/futsalcontent/editfutsal";
import CreateFutsal from "./components/user/futsalcontent/createfutsal";

import SideBar from "./components/admin/Sidebar/SideBar";
import ManageUsers from "./components/admin/manageUsers/manageUsers";
import Dashboard from "./components/admin/dashboard/dashboard";
import Managefutsal from "./components/admin/manageFutsal/manageFutsal";
import ManageReserve from "./components/admin/manageReserve/manageReserve";
import ManagePayment from "./components/admin/managePayment/managePayment";
import ManageMessage from "./components/admin/manageMeassge/manageMessage";

import LocationPicker from "./components/try/LocationPicker";
// import RequireAuth from "./globalComponents/auth/RequireAuth";

function App() {
  return (
    <Router>
      <Routes>
        <Route path="/location" element={<LocationPicker />} />
        {/* User Routes */}
        <Route path="/" element={<Login />} />
        <Route path="/signup" element={<Signup />} />
        <Route path="/home" element={<Home />} />
```

Everest Innovative College
Solteemode, Kathmandu

Bachelor in Computer Applications (BCA)

Project Log – Sheet

Year/Semester: 6th Sem

Project Name: Futsal Management System

Supervisor's Name: Binaya Subedi

Student's Name: Rohan Shrestha

S.N.	Date	Topic/Issue Discussed	Comments/Next Target	Signature of Supervisor
