

IIT GUWAHATI  
DEPARTMENT OF MATHEMATICS  
MASTER OF SCIENCE (M.Sc.) - 3rd SEMESTER

**DATABASE MANAGEMENT SYSTEM PROJECT REPORT**

**Project Title: Parking Lot Management Systems.**

Submitted By

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## **Project Overview**

The **Parking Lot Management System** is a comprehensive software application developed to streamline the management of parking spaces. It is designed to provide efficient slot allocation, monitor vehicle entries and exits, and maintain detailed records of users and their bookings. This system aims to reduce manual intervention and improve operational efficiency, particularly in institutional settings.

## **Objectives**

- Efficient management of parking slots.
- Automated handling of booking requests and approvals.
- Prevention of redundant data entries in the database.
- User authentication and secure storage of credentials.
- Simplification of record-keeping for vehicle entries and exits.

## **System Modules**

The system consists of the following modules:

### **3.1 Admin Module**

- Tracks total available parking slots and their allocation.
- Handles booking requests and assigns slot numbers.
- Manages vehicle entry and exit records.

### **3.2 User Module**

- Facilitates user registration and login.
- Allows users to book parking slots by providing vehicle details and estimated parking duration.

### **3.3 Booking Module**

- Processes and stores booking requests.
- Tracks the status of bookings (Pending, Confirmed, Out).
- Prevents multiple bookings for the same vehicle simultaneously.

### **3.4 Vehicle Information Module**

- Maintains detailed records of parked vehicles, including their entry and exit dates.
- Ensures no redundancy by enforcing unique constraints on vehicle numbers.

## Database Design

### 4.1 Database Name: parking\_project

The database comprises the following four tables:

#### Tables and Their Descriptions

##### user\_info

- Stores user credentials and personal information.
- Structure:

```
MariaDB [parking_project]> DESC user_info;
```

Field	Type	Null	Key	Default	Extra
id	int(11)	NO	PRI	NULL	auto_increment
username	varchar(100)	NO		NULL	
password	varchar(100)	NO		NULL	
email	varchar(100)	NO		NULL	

4 rows in set (0.024 sec)

##### admin\_info

- Stores admin credentials for managing the system.
- Structure:

```
MariaDB [parking_project]> DESC admin_info;
```

Field	Type	Null	Key	Default	Extra
id	int(11)	NO	PRI	NULL	auto_increment
username	varchar(100)	NO		NULL	
password	varchar(100)	NO		NULL	

3 rows in set (0.023 sec)

## booking

- Tracks parking slot bookings, including the user and admin associated with each request.
- Structure:

```
MariaDB [parking_project]> DESC booking;
```

Field	Type	Null	Key	Default	Extra
id	int(11)	NO	PRI	NULL	auto_increment
user_id	int(11)	YES	MUL	NULL	
admin_id	int(11)	YES	MUL	NULL	
vehicle_id	int(11)	YES	MUL	NULL	
Slot_number	int(11)	YES		NULL	
Owner_name	varchar(100)	YES		NULL	
Vehicle_name	varchar(100)	YES		NULL	
Vehicle_number	varchar(50)	YES		NULL	
Estimate_time	int(11)	YES		NULL	
Booking_time	timestamp	NO		current_timestamp()	
Status	enum('Pending','Confirmed','Out')	YES		Pending	

11 rows in set (0.025 sec)

## vehicle\_info

- Maintains records of all parked vehicles and their associated details.
- Structure:

```
MariaDB [parking_project]> DESC vehicle_info;
```

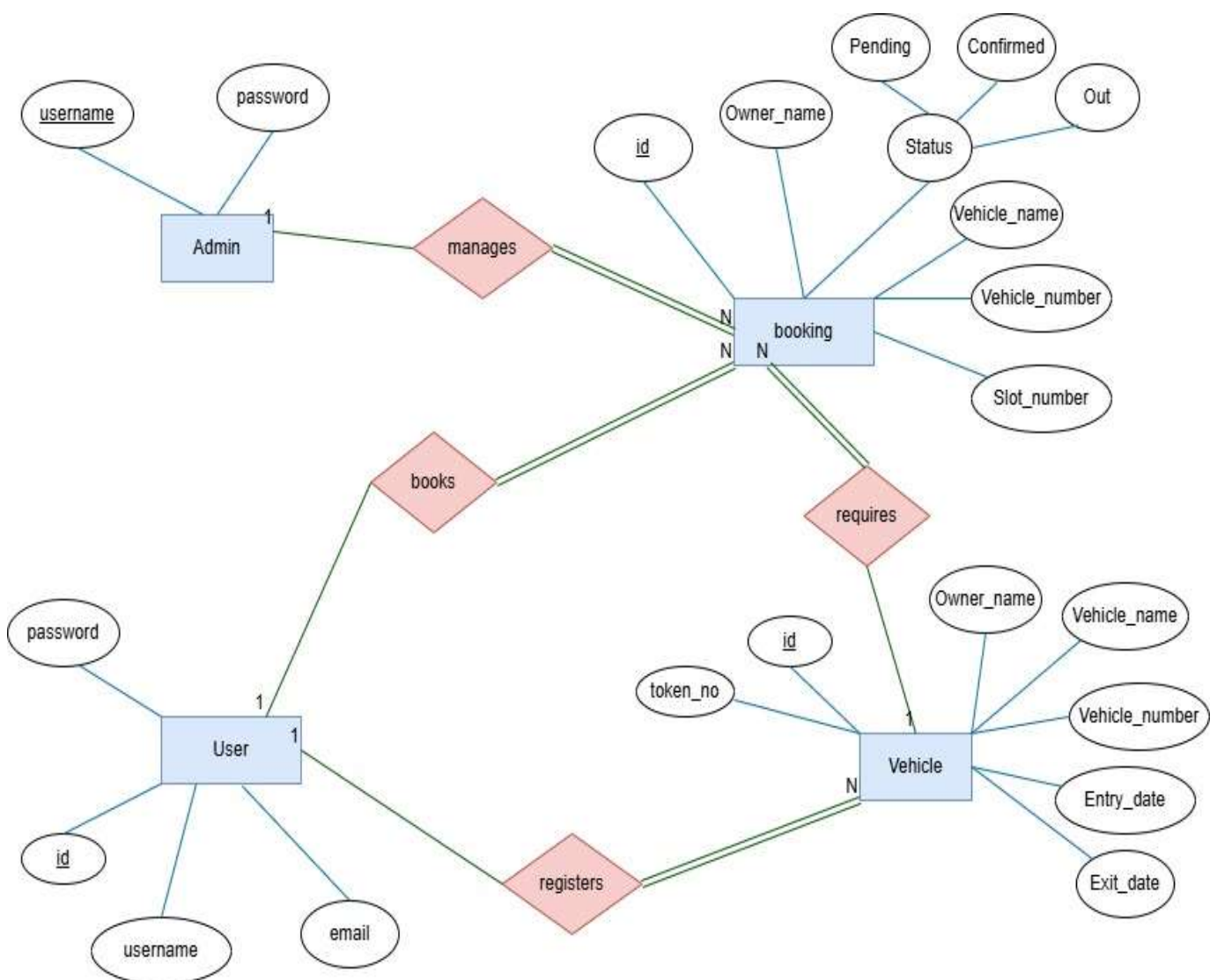
Field	Type	Null	Key	Default	Extra
id	int(11)	NO	PRI	NULL	auto_increment
user_id	int(11)	YES	MUL	NULL	
Token_number	int(11)	YES		NULL	
Owner_name	varchar(100)	NO		NULL	
Vehicle_name	varchar(100)	NO		NULL	
Vehicle_number	varchar(50)	NO	UNI	NULL	
Entry_date	datetime	NO		NULL	
Exit_date	datetime	YES		NULL	

8 rows in set (0.022 sec)

## Entity-Relationship (ER) Diagram

The ER diagram provides a visual representation of the relationships between entities in the system. Key relationships include:

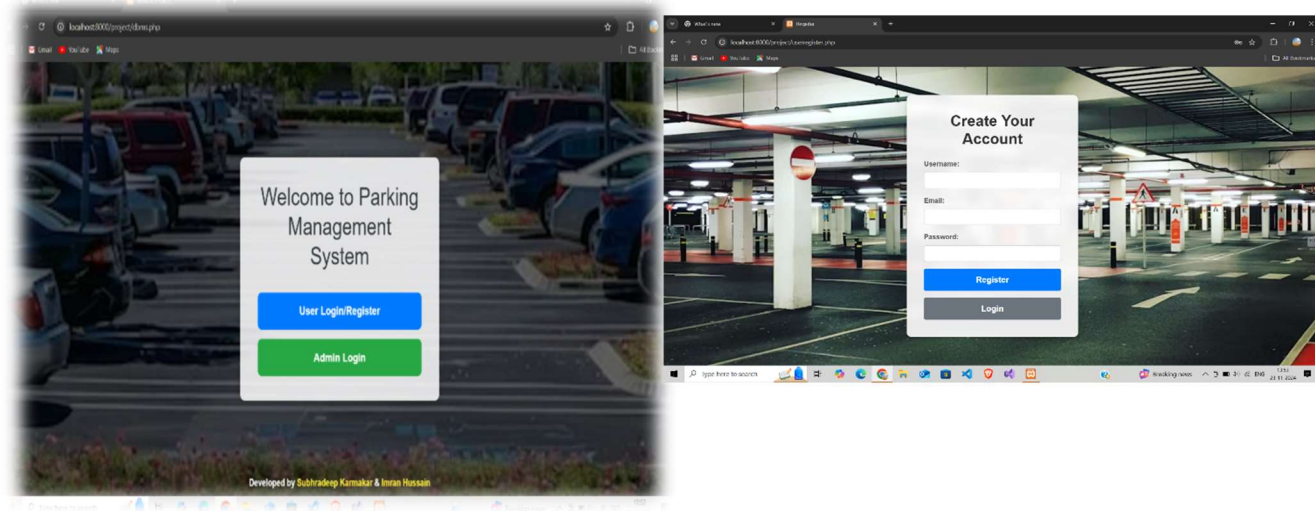
- **user\_info ↔ booking**: Users can make multiple bookings.
- **admin\_info ↔ booking**: Admins manage bookings and assign slots.
- **vehicle\_info ↔ booking**: Vehicles are associated with specific bookings.



# System Functionality

## 6.1 User/Admin Login Page

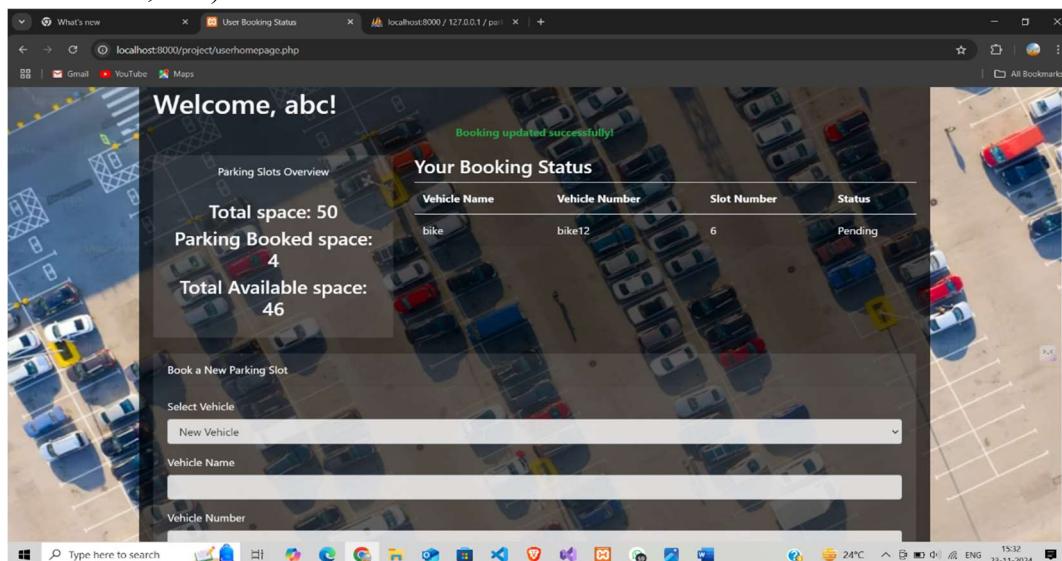
- **Purpose:** Secure authentication for users and admins.
- **Features:**
  - Separate login interfaces for users and admins.
  - Credential validation against the `user_info` and `admin_info` tables.



## User Homepage

- **Purpose:** Provide users with an intuitive interface to manage their bookings.
- **Features:** Booking Request: Users can submit booking requests by providing details such as vehicle name, number, and estimated parking duration.

**Booking Status Display:** Real-time updates on the status of requests (Pending, Confirmed, Out).



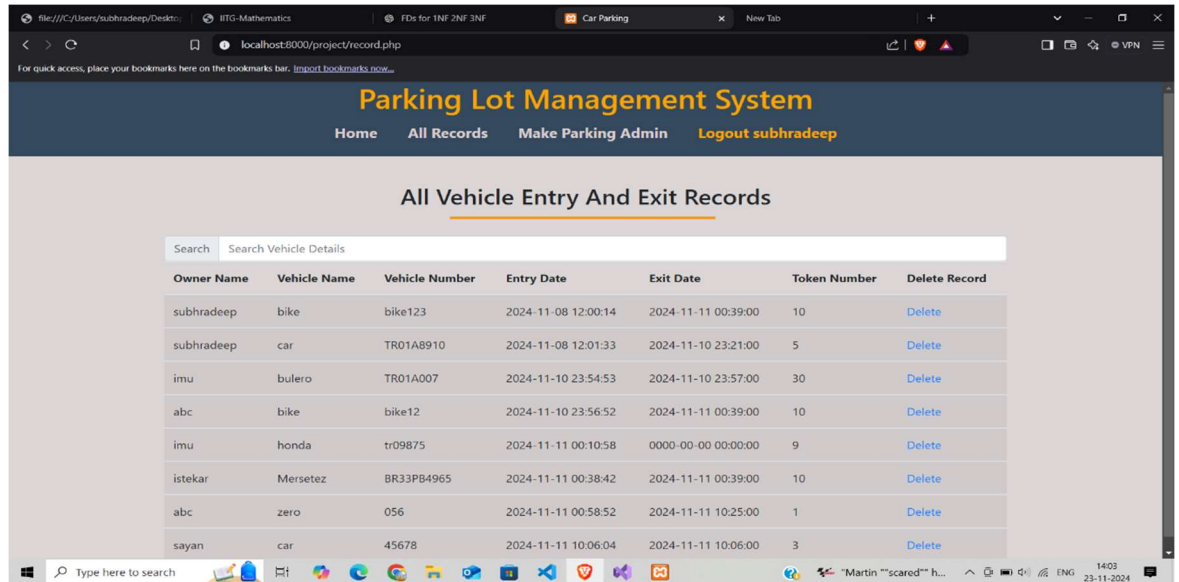


## Admin Homepage

The admin homepage consolidates critical management functionalities:

### 1. All Vehicle Entry and Exit Records

- Displays complete records of vehicles that have entered and exited the parking lot.
- Includes details such as entry date, exit date, vehicle name, and slot number.

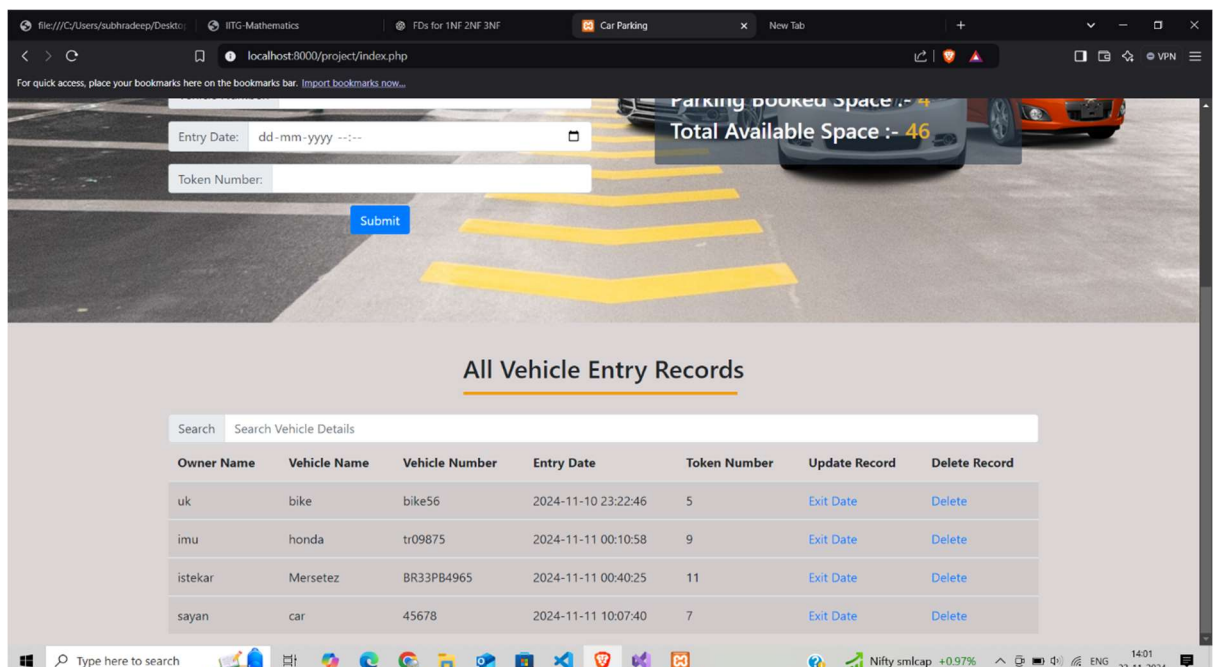


The screenshot shows the 'All Vehicle Entry And Exit Records' page. It features a search bar at the top and a table with the following data:

Owner Name	Vehicle Name	Vehicle Number	Entry Date	Exit Date	Token Number	Delete Record
subhadeep	bike	bike123	2024-11-08 12:00:14	2024-11-11 00:39:00	10	<a href="#">Delete</a>
subhadeep	car	TR01A8910	2024-11-08 12:01:33	2024-11-10 23:21:00	5	<a href="#">Delete</a>
imu	bulero	TR01A007	2024-11-10 23:54:53	2024-11-10 23:57:00	30	<a href="#">Delete</a>
abc	bike	bike12	2024-11-10 23:56:52	2024-11-11 00:39:00	10	<a href="#">Delete</a>
imu	honda	tr09875	2024-11-11 00:10:58	0000-00-00 00:00:00	9	<a href="#">Delete</a>
istekar	Mersetez	BR33PB4965	2024-11-11 00:38:42	2024-11-11 00:39:00	10	<a href="#">Delete</a>
abc	zero	056	2024-11-11 00:58:52	2024-11-11 10:25:00	1	<a href="#">Delete</a>
sayan	car	45678	2024-11-11 10:06:04	2024-11-11 10:06:00	3	<a href="#">Delete</a>

### 1. All Vehicle Entry Records

- Tracks active vehicle entries.
- Excludes records of vehicles that have exited the premises.



The screenshot shows the 'All Vehicle Entry Records' page. It features a search bar at the top and a table with the following data:

Owner Name	Vehicle Name	Vehicle Number	Entry Date	Token Number	Update Record	Delete Record
uk	bike	bike56	2024-11-10 23:22:46	5	<a href="#">Exit Date</a>	<a href="#">Delete</a>
imu	honda	tr09875	2024-11-11 00:10:58	9	<a href="#">Exit Date</a>	<a href="#">Delete</a>
istekar	Mersetez	BR33PB4965	2024-11-11 00:40:25	11	<a href="#">Exit Date</a>	<a href="#">Delete</a>
sayan	car	45678	2024-11-11 10:07:40	7	<a href="#">Exit Date</a>	<a href="#">Delete</a>

## Booking Requests

- Displays all pending booking requests.
- Admin can approve requests by assigning a slot number, which updates the booking status in the database.
- Prevents assigning occupied slots, ensuring data consistency.

The screenshot shows a web application interface for managing parking bookings. The background is a 3D rendering of a parking lot with several cars. The interface includes a 'Return to Home' button and two main sections:

### Booking Requests

Owner Name	Vehicle Name	Vehicle Number	Estimate Time (mins)	Booking Time	Status	Slot Number	Actions
abc	bike	bike12	60 mins	2024-11-23 14:01:50	Pending	1	Approve
sayan	bike	568	77 mins	2024-11-11 10:20:25	Pending	Select Slot	Approve

### All Active Vehicle Entries (Vehicles Not Exited Yet)

Owner Name	Vehicle Name	Vehicle Number	Entry Date	Exit Date	Token Number
uk	bike	bike56	2024-11-10 23:22:46	0000-00-00 00:00:00	5
imu	honda	tr09875	2024-11-11 00:10:58	0000-00-00 00:00:00	9
istekar	Mersetez	BR33PB4965	2024-11-11 00:40:25	0000-00-00 00:00:00	11
sayan	car	45678	2024-11-11 10:07:40	0000-00-00 00:00:00	7

This screenshot shows the same web application interface as the previous one, but with the 'Slot Number' dropdown menu for the second pending request (sayan) open. The dropdown menu displays a list of available slot numbers from 1 to 22. The first slot, '1', is currently selected.

### Booking Requests

Owner Name	Vehicle Name	Vehicle Number	Estimate Time (mins)	Booking Time	Status	Slot Number	Actions
abc	bike	bike12	60 mins	2024-11-23 14:01:50	Pending	1	Approve
sayan	bike	568	77 mins	2024-11-11 10:20:25	Pending	6, 8, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22	Approve

### All Active Vehicle Entries (Vehicles Not Exited Yet)

Owner Name	Vehicle Name	Vehicle Number	Entry Date	Exit Date	Token Number
uk	bike	bike56	2024-11-10 23:22:46	0000-00-00 00:00:00	5
imu	honda	tr09875	2024-11-11 00:10:58	0000-00-00 00:00:00	9
istekar	Mersetez	BR33PB4965	2024-11-11 00:40:25	0000-00-00 00:00:00	11
sayan	car	45678	2024-11-11 10:07:40	0000-00-00 00:00:00	7



## Additional Features

### *Dynamic Slot Allocation*

- The admin can assign a slot number to each booking based on availability.
- Slot status updates dynamically in the system, preventing double bookings.

### *Autofill Feature for Repeated Bookings*

- Previously used vehicle details (e.g., vehicle name and number) autofill for returning users to simplify the booking process.

### *Vehicle Exit Updates*

- Admins can update the `Exit_date` for vehicles. Once exited, the corresponding records are removed from active lists.

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## 8. Challenges and Solutions

### *Challenges:*

- Managing dynamic data updates without redundancy.
- Ensuring smooth interaction between the database and user interface.
- Avoiding slot conflicts during manual slot assignments.

### *Solutions:*

- Implemented unique constraints and dynamic updates in the database schema.
- Enhanced user interface with error handling for slot conflicts.
- Automated record maintenance with conditional queries to ensure data integrity.

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## 9. Conclusion

The **Parking Lot Management System** is a robust, user-friendly solution that automates parking space management. It significantly reduces manual errors, enhances user satisfaction, and provides a streamlined process for managing bookings, slot allocations, and vehicle records. This project demonstrates the effective application of database management principles to solve real-world problems.