



22AIE457

FULL STACK DEVELOPMENT PROJECT REPORT



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DESCRIPTION:

ParkEasy: A web-based system to manage urban parking efficiently with real-time spot allocation, user/admin roles, and analytics. The system offers booking, tracking, and data visualization features.

TECHNOLOGY USED:

- Flask (App + API): Backend logic, routing, request handling Used for implementing RESTful endpoints and server-side business logic for parking management operations.
- SQLite + SQLAlchemy: Data modeling, relationships, persistence Provides a normalized database schema with efficient relationship management for users, parking lots, spots, and reservations.
- HTML + Jinja2: Server-side template rendering Creates dynamic web pages with backend data integration for both admin and user interfaces.
- Bootstrap + CSS: Styling and layout Responsive framework ensuring mobile-friendly design with professional UI components and consistent styling.
- JavaScript/AJAX (Vanilla): Interactivity, client-side functionality Handles form validation, dynamic content updates, and chart rendering for analytics dashboards.
- Authentication (Login/Auth): Login/logout, role-based access Session-based authentication system with role differentiation between regular users and administrators.

DATABASE DESIGN:

- User
 - \circ id (PK)
 - o email
 - o password
 - o created at
- UserRole
 - \circ id (PK)
 - \circ user id (FK \rightarrow User.id)
 - \circ role id (FK \rightarrow Role.id)
- Role
 - o id (PK)
 - o name
- Reservation
 - \circ id (PK)
 - \circ spot id (FK \rightarrow ParkingSpot.id)
 - o user id (FK \rightarrow User.id)
 - o vehicle number
 - o parking timestamp
 - o leaving_timestamp
 - o parking cost
 - o is active
- ParkingSpot

- \circ id (PK)
- \circ lot id (FK \rightarrow ParkingLot.id)
- o spot number
- o status

ParkingLot

- \circ id (PK)
- o prime location name
- o price
- o address
- o pin code
- o maximum number of spots
- o created at

• Relationships

- User \leftrightarrow UserRole (1:M)
- UserRole \leftrightarrow Role (M:1)
- User \leftrightarrow Reservation (1:M)
- \circ Reservation \leftrightarrow ParkingSpot (M:1)
- $\bigcirc \quad \text{ParkingSpot} \longleftrightarrow \text{ParkingLot} \ (M:1)$

The following are the constraints that are enforced on the schema to ensure it is normalizedd to its maximum and other anomalies are being considered.

- Primary Key Constraints
 - o Each table has a defined Primary Key.
 - o Cascade deletion is applied for maintaining data integrity.
 - O User.email must be unique.
 - Only one active reservation per user is allowed.
 - o Proper indexing on all foreign keys is enforced for performance.
- Business Logic Constraints
 - O A user can have only one active reservation at a time (is active = True).
 - O A parking spot can have only one active reservation at a time.
 - O ParkingSpot.status must be either 'A' (Available) or 'O' (Occupied).
 - o ParkingLot.price must always be a positive value.
 - O ParkingLot.maximum number of spots must be greater than 0.

API DESIGN:

- The application implements RESTful API endpoints for data exchange and frontend integration.
- Implementation features
 - o Session-based authentication.
 - Input Validation
 - o Error handling with appropriate HTTPS status codes
 - o JSON response format for AJAX calls
 - o Proper foreign key relationship handling

ARCHITECTURE:

- The application follows MVC (Model-View-Controller) architecture with clear separation of concerns.
 - o /controllers: Database models, routing logic, and configuration
 - o /templates: Jinja2 templating for dynamic content rendering.

The system includes secure session-based user authentication with role management, real-time booking with automated spot assignment, and dynamic pricing. Admins can perform CRUD operations on parking lots, while users access reservation history and booking functionality. Interactive analytics dashboards visualize occupancy and revenue data for admins

CODE:

Base.html:

```
<!DOCTYPE html>
<html lang="en">
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>{% block title %}Vehicle Parking System{% endblock %}</title>
link <u>href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css" (</u>
rel="stylesheet">
k href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.0.0/css/all.min.css"
rel="stylesheet">
.navbar-brand {
font-weight: bold;
.hero-section {
background: linear-gradient(135deg, #667eea 0%, #764ba2 100%);
color: white;
padding: 80px 0;
.card {
border: none;
box-shadow: 0 4px 6px rgba(0, 0, 0, 0.1);
.parking-spot {
width: 50px;
height: 30px;
margin: 2px;
border-radius: 4px;
display: inline-block;
text-align: center;
```

```
line-height: 30px;
font-size: 12px;
font-weight: bold;
.spot-available {
background-color: #28a745;
color: white:
.spot-occupied {
background-color: #dc3545;
color: white;
.stats-card {
background: linear-gradient(45deg, #f093fb 0%, #f5576c 100%);
color: white;
</style>
<nav class="navbar navbar-expand-lg navbar-dark bg-dark">
<div class="container">
<a class="navbar-brand" href="{{ url_for('home') }}">
<i class="fas fa-car"></i> ParkEasy
<button class="navbar-toggler" type="button" data-bs-toggle="collapse" data-bs-target="#navbarNav">
<span class="navbar-toggler-icon"></span>
</button>
<div class="collapse navbar-collapse" id="navbarNav">
ul class="navbar-nav me-auto">
{% if 'email' in session %}
{% if 'admin' in session.get('roles', []) %}
class="nav-item">
<a class="nav-link" href="{{ url_for('admin_dashboard') }}">
<i class="fas fa-tachometer-alt"></i> Admin Dashboard
{% else %}
class="nav-item">
<a class="nav-link" href="{{ url_for('user_dashboard') }}">
<i class="fas fa-user"></i> My Dashboard
{% endif %}
{% endif %}
```

```
{% if 'email' in session %}
<a class="nav-link dropdown-toggle" href="#" role="button" data-bs-toggle="dropdown">
<i class="fas fa-user-circle"></i> {{ session['email'] }}
ul class="dropdown-menu">
<a class="dropdown-item" href="{{ url_for('logout') }}">
<i class="fas fa-sign-out-alt"></i> Logout
{% else %}
class="nav-item">
<a class="nav-link" href="{{ url_for('login') }}">
<i class="fas fa-sign-in-alt"></i> Login
class="nav-item">
<a class="nav-link" href="{{ url_for('register') }}">
<i class="fas fa-user-plus"></i> Register
{% endif %}
</div>
</div>
</nav>
{% with messages = get_flashed_messages(with_categories=true) %}
{% if messages %}
<div class="container mt-3">
{% for category, message in messages %}
<div class="alert alert-{{ 'danger' if category == 'error' else 'success' }} alert-dismissible fade show"</pre>
role="alert">
{{ message }}
<button type="button" class="btn-close" data-bs-dismiss="alert"></button>
</div>
{% endfor %}
</div>
{% endif %}
{% endwith %}
```

```
{% block content %}{% endblock %}

</main>

<footer class="bg-dark text-light py-4 mt-5">

<div class="container text-center">

&copy; 2025 ParkEasy - Vehicle Parking System. All rights reserved.
</div>
</div>
</footer>

<script <a href="mailto:src="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/js/bootstrap.bundle.min.js"></a></a>/script>
{% block scripts %}{% endblock %}

</body>
</html>
```

Index.html:

```
{% extends "base.html" %}
{% block title %}Welcome - Vehicle Parking System{% endblock %}
{% block content %}
<div class="hero-section">
<div class="container text-center">
<h1 class="display-4 mb-4">
<i class="fas fa-car"></i> Welcome to ParkEasy
</h1>
Smart Vehicle Parking Management System
Find and reserve parking spots quickly and efficiently
<div class="row justify-content-center">
<div class="col-md-8">
<div class="row">
<div class="col-md-6 mb-3">
<a href="{{ url_for('login') }}" class="btn btn-light btn-lg w-100">
<i class="fas fa-sign-in-alt"></i> Login to Your Account
</div>
<div class="col-md-6 mb-3">
<a href="{{ url_for('register') }}" class="btn btn-outline-light btn-lg w-100">
<i class="fas fa-user-plus"></i> Create New Account
</div>
```

```
</div>
</div>
</div>
</div>
</div>
<div class="container py-5">
<div class="row">
<div class="col-md-4 mb-4">
<div class="card h-100 text-center">
<div class="card-body">
<div class="text-primary mb-3">
<i class="fas fa-search fa-3x"></i>
</div>
<h5 class="card-title">Find Parking</h5>
Search for available parking spots in your preferred location.
</div>
</div>
</div>
<div class="col-md-4 mb-4">
<div class="card h-100 text-center">
<div class="card-body">
<div class="text-success mb-3">
<i class="fas fa-calendar-check fa-3x"></i>
</div>
<h5 class="card-title">Book Instantly</h5>
Reserve your parking spot with just one click.
</div>
</div>
</div>
<div class="col-md-4 mb-4">
<div class="card h-100 text-center">
<div class="card-body">
<div class="text-warning mb-3">
<i class="fas fa-rupee-sign fa-3x"></i>
</div>
<h5 class="card-title">Easy Payment</h5>
Pay only for the time you use with transparent pricing.
</div>
</div>
</div>
</div>
</div>
```

{% endblock %}

admin dashboard.html:

```
{% extends "base.html" %}
{% block title %}Admin Dashboard - Vehicle Parking System{% endblock %}
{% block content %}
<div class="container-fluid py-4">
<div class="row mb-4">
<div class="col-12">
<h2><i class="fas fa-tachometer-alt"></i> Admin Dashboard</h2>
Manage parking lots, view statistics, and monitor user activity
</div>
</div>
<!-- Statistics Cards -->
<div class="row mb-4">
<div class="col-md-3 mb-3">
<div class="card stats-card">
<div class="card-body text-center">
<i class="fas fa-building fa-2x mb-2"></i>
<h4>{{ total_lots }}</h4>
Total Parking Lots
</div>
</div>
</div>
<div class="col-md-3 mb-3">
<div class="card bg-info text-white">
<div class="card-body text-center">
<i class="fas fa-car fa-2x mb-2"></i>
<h4>{{ total_spots }}</h4>
Total Parking Spots
</div>
</div>
</div>
<div class="col-md-3 mb-3">
<div class="card bg-success text-white">
<div class="card-body text-center">
<i class="fas fa-check-circle fa-2x mb-2"></i>
<h4>{{ total_available }}</h4>
```

```
Available Spots
</div>
</div>
</div>
<div class="col-md-3 mb-3">
<div class="card bg-danger text-white">
<div class="card-body text-center">
<i class="fas fa-times-circle fa-2x mb-2"></i>
<h4>{{ total_occupied }}</h4>
Occupied Spots
</div>
</div>
</div>
</div>
<!-- Action Buttons -->
<div class="row mb-4">
<div class="col-12">
<a href="{{ url_for('add_parking_lot') }}" class="btn btn-primary">
<i class="fas fa-plus"></i> Add New Parking Lot
</div>
</div>
<!-- Summary Charts Section -->
<div class="row mb-4">
<div class="col-md-6 mb-3">
<div class="card">
<div class="card-header bg-primary text-white">
<h5><i class="fas fa-chart-pie"></i> Revenue Distribution by Parking Lot</h5>
</div>
<div class="card-body">
<canvas id="revenueChart" width="400" height="300"></canvas>
<div id="revenueChartEmpty" class="text-center py-4" style="display: none;">
<i class="fas fa-chart-pie fa-3x text-muted mb-3"></i>
<h6>No revenue data available</h6>
Revenue will appear here once users complete their parking sessions.
</div>
</div>
</div>
</div>
<div class="col-md-6 mb-3">
<div class="card">
<div class="card-header bg-success text-white">
```

```
<h5><i class="fas fa-chart-bar"></i> Parking Spot Occupancy</h5>
</div>
<div class="card-body">
<canvas id="occupancyChart" width="400" height="300"></canvas>
<div id="occupancyChartEmpty" class="text-center py-4" style="display: none;">
<i class="fas fa-chart-bar fa-3x text-muted mb-3"></i>
<h6>No parking lots available</h6>
Add parking lots to see occupancy data.
</div>
</div>
</div>
</div>
</div>
<!-- Parking Lots Table -->
<div class="row">
<div class="col-12">
<div class="card">
<div class="card-header">
<h5><i class="fas fa-building"></i> Parking Lots Management</h5>
</div>
<div class="card-body">
{% if parking_lots %}
<div class="table-responsive">
ID
Location Name
Address
Pin Code
Price (₹/hour)
Total Spots
Available
Occupied
Actions
{% for lot in parking_lots %}
{{ lot.id }}
<strong>{{ lot.prime_location_name }}</strong>
{{ lot.address }}
```

```
{{ lot.pin_code }}
₹{{ lot.price }}
{{ lot.maximum_number_of_spots }}
<span class="badge bg-success">{{ lot.available_spots_count }}</span>
<span class="badge bg-danger">{{ lot.occupied_spots_count }}</span>
<div class="btn-group btn-group-sm">
<a href="{{ url_for('view_parking_lot', lot_id=lot.id) }}"
class="btn btn-info" title="View Details">
<i class="fas fa-eye"></i>
<a href="{{ url_for('edit_parking_lot', lot_id=lot.id) }}"
class="btn btn-warning" title="Edit">
<i class="fas fa-edit"></i>
{% if lot.occupied_spots_count == 0 %}
<a href="{{ url_for('delete_parking_lot', lot_id=lot.id) }}"</pre>
class="btn btn-danger" title="Delete"
onclick="return confirm('Are you sure you want to delete this parking lot?')">
<i class="fas fa-trash"></i>
{% else %}
<button class="btn btn-secondary" disabled title="Cannot delete - spots occupied">
<i class="fas fa-trash"></i>
</button>
{% endif %}
</div>
{% endfor %}
</div>
{% else %}
<div class="text-center py-4">
<i class="fas fa-building fa-3x text-muted mb-3"></i>
<h5>No parking lots found</h5>
Start by adding your first parking lot.
<a href="{{ url_for('add_parking_lot') }}" class="btn btn-primary">
<i class="fas fa-plus"></i> Add Parking Lot
```

```
{% endif %}
</div>
</div>
</div>
</div>
<div class="row mt-4">
<div class="col-12">
<div class="card">
<div class="card-header">
<h5><i class="fas fa-users"></i> Registered Users</h5>
</div>
<div class="card-body">
{% if users %}
<div class="table-responsive">
ID
Email
Vehicle Number
Registration Date
</thead>
{% for user in users %}
{{ user.id }}
{{ user.email }}
{{ user.vehicle_number or 'Not provided' }}
{{ user.created_at.strftime('%Y-%m-%d %H:%M') }}
{% endfor %}
</div>
{% else %}
<div class="text-center py-4">
<i class="fas fa-users fa-3x text-muted mb-3"></i>
<h5>No users registered yet</h5>
</div>
```

```
{% endif %}
</div>
</div>
</div>
</div>
</div>
<script src="https://cdn.jsdelivr.net/npm/chart.js"></script>
// Revenue Chart (Pie Chart)
async function loadRevenueChart() {
try {
const response = await fetch('/api/admin/revenue-chart-data');
const data = await response.json();
const ctx = document.getElementById('revenueChart').getContext('2d');
if (data.labels.length === 0 || data.data.every(value => value === 0)) {
document.getElementById('revenueChart').style.display = 'none';
document.getElementById('revenueChartEmpty').style.display = 'block';
return;
const backgroundColors = [
'#FF6384', '#36A2EB', '#FFCE56', '#4BC0C0',
'#9966FF', '#FF9F40', '#FF6384', '#C9CBCF'
new Chart(ctx, {
type: 'doughnut',
data: {
labels: data.labels,
datasets: [{
data: data.data,
backgroundColor: backgroundColors.slice(0, data.labels.length),
borderWidth: 2,
borderColor: '#fff'
}]
options: {
responsive: true,
maintainAspectRatio: false,
plugins: {
title: {
display: true,
text: 'Total Revenue: \mathbf{\xi}' + data.data.reduce((a, b) => a + b, 0).toFixed(2)
legend: {
```

```
position: 'bottom'
tooltip: {
callbacks: {
label: function(context) {
return context.label + ': ₹' + context.parsed.toFixed(2);
} catch (error) {
console.error('Error loading revenue chart:', error);
document.getElementById('revenueChart').style.display = 'none';
document.getElementById('revenueChartEmpty').style.display = 'block';
// Occupancy Chart (Bar Chart)
async function loadOccupancyChart() {
try {
const response = await fetch('/api/admin/occupancy-chart-data');
const data = await response.json();
const ctx = document.getElementById('occupancyChart').getContext('2d');
if (data.length === 0) {
document.getElementById('occupancyChart').style.display = 'none';
document.getElementById('occupancyChartEmpty').style.display = 'block';
return;
const labels = data.map(item => item.name);
const occupiedData = data.map(item => item.occupied);
const availableData = data.map(item => item.available);
new Chart(ctx, {
type: 'bar',
data: {
labels: labels,
datasets: [
label: 'Occupied',
data: occupiedData,
backgroundColor: '#dc3545',
borderColor: '#dc3545',
borderWidth: 1
```

```
label: 'Available',
data: availableData,
backgroundColor: '#28a745',
borderColor: '#28a745',
borderWidth: 1
options: {
responsive: true,
maintainAspectRatio: false,
scales: {
x: {
stacked: true
y: {
stacked: true,
beginAtZero: true,
ticks: {
stepSize: 1
plugins: {
legend: {
position: 'top'
tooltip: {
callbacks: {
title: function(context) {
return context[0].label;
label: function(context) {
return context.dataset.label + ': ' + context.parsed.y + ' spots';
} catch (error) {
console.error('Error loading occupancy chart:', error);
```

```
document.getElementById('occupancyChart').style.display = 'none';
document.getElementById('occupancyChartEmpty').style.display = 'block';
}
}
// Load charts when page loads
document.addEventListener('DOMContentLoaded', function() {
loadRevenueChart();
loadOccupancyChart();
});
</script>
{% endblock %}
```

Add parking lot.html:

```
{% extends "base.html" %}
{% block title %}Add Parking Lot - Admin{% endblock %}
{% block content %}
<div class="container py-5">
<div class="row justify-content-center">
<div class="col-md-8">
<div class="card">
<div class="card-header bg-primary text-white">
<h4><i class="fas fa-plus"></i> Add New Parking Lot</h4>
<div class="card-body">
<form method="POST">
<div class="row">
<div class="col-md-6">
<div class="mb-3">
<label for="name" class="form-label">Location Name</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-map-marker-alt"></i></span>
<input type="text" class="form-control" id="name" name="name"
placeholder="e.g., Downtown Plaza" required>
</div>
</div>
</div>
<div class="col-md-6">
<div class="mb-3">
<label for="pin_code" class="form-label">Pin Code</label>
```

```
<div class="input-group">
<span class="input-group-text"><i class="fas fa-map-pin"></i></span>
<input type="text" class="form-control" id="pin_code" name="pin_code"</p>
placeholder="e.g., 110001" required>
</div>
</div>
</div>
</div>
<div class="mb-3">
<label for="address" class="form-label">Address</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-home"></i></span>
<textarea class="form-control" id="address" name="address" rows="3"
placeholder="Full address of the parking lot" required></textarea>
</div>
</div>
<div class="row">
<div class="col-md-6">
<div class="mb-3">
<label for="price" class="form-label">Price per Hour (₹)</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-rupee-sign"></i></span>
<input type="number" class="form-control" id="price" name="price"
step="0.01" min="0" placeholder="e.g., 50" required>
</div>
</div>
</div>
<div class="col-md-6">
<div class="mb-3">
<label for="max_spots" class="form-label">Maximum Number of Spots</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-car"></i></span>
<input type="number" class="form-control" id="max_spots" name="max_spots"
min="1" placeholder="e.g., 20" required>
</div>
</div>
</div>
<div class="d-grid gap-2 d-md-flex justify-content-md-end">
<a href="{{ url_for('admin_dashboard') }}" class="btn btn-secondary">
<i class="fas fa-arrow-left"></i> Back to Dashboard
<button type="submit" class="btn btn-primary">
<i class="fas fa-save"></i> Add Parking Lot
```

```
</br>
</div>
</form>
</div>
```

Edit parking lot.html:

```
{% extends "base.html" %}
{% block title %}Edit Parking Lot - Admin{% endblock %}
{% block content %}
<div class="container py-5">
<div class="row justify-content-center">
<div class="col-md-8">
<div class="card">
<div class="card-header bg-warning text-dark">
<h4><i class="fas fa-edit"></i> Edit Parking Lot</h4>
</div>
<div class="card-body">
<form method="POST">
<div class="row">
<div class="col-md-6">
<div class="mb-3">
<label for="name" class="form-label">Location Name</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-map-marker-alt"></i></span>
<input type="text" class="form-control" id="name" name="name"
value="{{ parking_lot.prime_location_name }}" required>
</div>
</div>
</div>
<div class="col-md-6">
<div class="mb-3">
<label for="pin_code" class="form-label">Pin Code</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-map-pin"></i></span>
```

```
<input type="text" class="form-control" id="pin_code" name="pin_code"
value="{{ parking_lot.pin_code }}" required>
</div>
</div>
</div>
</div>
<div class="mb-3">
<label for="address" class="form-label">Address</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-home"></i></span>
<textarea class="form-control" id="address" name="address" rows="3"
required>{{ parking_lot.address }}</textarea>
</div>
</div>
<div class="row">
<div class="col-md-6">
<div class="mb-3">
<a href="label">Price per Hour (\mathfrak{T})</a></abel>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-rupee-sign"></i></span>
<input type="number" class="form-control" id="price" name="price"
step="0.01" min="0" value="{{ parking_lot.price }}" required>
</div>
</div>
</div>
<div class="col-md-6">
<div class="mb-3">
<label for="max_spots" class="form-label">Maximum Number of Spots</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-car"></i></span>
<input type="number" class="form-control" id="max_spots" name="max_spots"</pre>
min="1" value="{{ parking_lot.maximum_number_of_spots }}" required>
</div>
<div class="form-text">
Current spots: {{ parking_lot.parking_spots|length }}
({{ parking_lot.occupied_spots_count }} occupied)
</div>
</div>
</div>
</div>
<div class="d-grid gap-2 d-md-flex justify-content-md-end">
<a href="{{ url_for('admin_dashboard') }}" class="btn btn-secondary">
<i class="fas fa-arrow-left"></i> Back to Dashboard
```

```
<button type="submit" class="btn btn-warning">
<i class="fas fa-save"></i> Update Parking Lot
</button>
</div>
</form>
</div>
</di>
```

View parking lot.html:

```
{% extends "base.html" %}
{% block title %}View Parking Lot - {{ parking_lot.prime_location_name }}{% endblock %}
{% block content %}
<div class="container-fluid py-4">
<div class="row mb-4">
<div class="col-12">
<div class="d-flex justify-content-between align-items-center">
<h2><i class="fas fa-eye"></i> {{ parking_lot.prime_location_name }}</h2>
{{ parking_lot.address }} - {{ parking_lot.pin_code }}
</div>
<a href="{{ url_for('admin_dashboard') }}" class="btn btn-secondary">
<i class="fas fa-arrow-left"></i> Back to Dashboard
</div>
</div>
</div>
</div>
<!-- Parking Lot Info -->
<div class="row mb-4">
<div class="col-md-3">
<div class="card bg-info text-white">
<div class="card-body text-center">
<i class="fas fa-rupee-sign fa-2x mb-2"></i>
```

```
<h4>₹{{ parking_lot.price }}</h4>
Per Hour
</div>
</div>
</div>
<div class="col-md-3">
<div class="card bg-primary text-white">
<div class="card-body text-center">
<i class="fas fa-car fa-2x mb-2"></i>
<h4>{{ parking_lot.maximum_number_of_spots }}</h4>
Total Spots
</div>
</div>
</div>
<div class="col-md-3">
<div class="card bg-success text-white">
<div class="card-body text-center">
<i class="fas fa-check-circle fa-2x mb-2"></i>
<h4>{{ parking_lot.available_spots_count }}</h4>
Available
</div>
</div>
</div>
<div class="col-md-3">
<div class="card bg-danger text-white">
<div class="card-body text-center">
<i class="fas fa-times-circle fa-2x mb-2"></i>
<h4>{{ parking_lot.occupied_spots_count }}</h4>
Occupied
</div>
</div>
</div>
</div>
<!-- Parking Spots Grid -->
<div class="row mb-4">
<div class="col-12">
<div class="card">
<div class="card-header">
<h5><i class="fas fa-th"></i> Parking Spots Layout</h5>
</div>
<div class="card-body">
<div class="mb-3">
<span class="parking-spot spot-available">A</span> Available
```

```
<span class="parking-spot spot-occupied ms-3">0</span> Occupied
</div>
<div class="parking-grid">
{% for spot in parking_spots %}
<div class="parking-spot
{{ 'spot-available' if spot.status == 'A' else 'spot-occupied' }}"
title="Spot {{ spot.spot_number }} - {{ 'Available' if spot.status == 'A' else 'Occupied' }}">
{{ spot.spot_number }}
</div>
{% endfor %}
</div>
</div>
</div>
</div>
<!-- Active Reservations -->
<div class="row">
<div class="col-12">
<div class="card">
<div class="card-header">
<h5><i class="fas fa-users"></i> Active Reservations</h5>
</div>
<div class="card-body">
{% if active_reservations %}
<div class="table-responsive">
Spot Number
User Email
Vehicle Number
Parked Since
Duration
</thead>
{% for reservation, user, spot in active_reservations %}
<strong>{{ spot.spot_number }}</strong>
{{ user.email }}
{{ reservation.vehicle_number or 'Not provided' }}
{{ reservation.parking_timestamp.strftime('%Y-%m-%d %H:%M') }}
```

```
{% set duration = (current_time - reservation.parking_timestamp).total_seconds() / 3600 %}
{{ "%.1f"|format(duration) }} hours
{% endfor %}
</div>
{% else %}
<div class="text-center py-4">
<i class="fas fa-car fa-3x text-muted mb-3"></i>
<h5>No active reservations</h5>
All parking spots are currently available.
</div>
{% endif %}
</div>
</div>
</div>
</div>
</div>
.parking-grid {
display: grid;
grid-template-columns: repeat(auto-fit, minmax(60px, 1fr));
gap: 8px;
max-width: 800px;
{% endblock %}
```

User dashboard.html

```
{% extends "base.html" %}

{% block title %}User Dashboard - Vehicle Parking System{% endblock %}

{% block content %}

<div class="container-fluid py-4">

<div class="row mb-4">

<div class="row mb-4">

<div class="row class="col-12">

<h2><i class="fas fa-user"></i> Welcome, {{ session['email'] }}</h2>
```

```
Manage your parking reservations
</div>
</div>
<!-- Active Reservations -->
{% if active_reservations %}
<div class="row mb-4">
<div class="col-12">
<div class="card border-warning">
<div class="card-header bg-warning text-dark">
<h5><i class="fas fa-car"></i> Your Active Reservation</h5>
</div>
<div class="card-body">
{% for reservation, spot, lot in active_reservations %}
<div class="row">
<div class="col-md-8">
<h6><strong>{{ lot.prime_location_name }}</strong></h6>
<i class="fas fa-map-marker-alt"></i> {{ lot.address }}
<i class="fas fa-parking"></i> Spot Number:
<strong>{{ spot.spot_number }}</strong>
<i class="fas fa-car"></i> Vehicle Number:
<strong>{{ reservation.vehicle_number }}</strong>
<i class="fas fa-clock"></i> Parked since:
{{ reservation.parking_timestamp.strftime('%Y-%m-%d %H:%M') }}
<i class="fas fa-rupee-sign"></i> Rate: ₹{{ lot.price }}/hour
</div>
<div class="col-md-4 text-end">
<a href="{{ url_for('release_parking', reservation_id=reservation.id) }}"</pre>
class="btn btn-danger"
onclick="return confirm('Are you sure you want to release this parking spot?')">
<i class="fas fa-sign-out-alt"></i> Release Parking
</div>
</div>
{% endfor %}
</div>
</div>
</div>
</div>
{% endif %}
<!-- Available Parking Lots -->
<div class="row mb-4">
<div class="col-12">
```

```
<div class="card">
<div class="card-header bg-primary text-white">
<h5><i class="fas fa-search"></i> Available Parking Lots</h5>
<div class="card-body">
{% if not active_reservations %}
{% if parking_lots %}
<div class="row">
{% for lot in parking_lots %}
<div class="col-md-6 col-lg-4 mb-3">
<div class="card h-100">
<div class="card-body">
<h6 class="card-title">{{ lot.prime_location_name }}</h6>
{{ lot.address }}
<div class="mb-2">
<span class="badge bg-info">₹{{ lot.price }}/hour</span>
<span class="badge bg-success">{{ lot.available_spots_count }} available</span>
</div>
{% if lot.available_spots_count > 0 %}
<a href="{{ url_for('book_parking', lot_id=lot.id) }}"
class="btn btn-primary btn-sm w-100"
onclick="return confirm('Book parking at {{ lot.prime_location_name }}?')">
<i class="fas fa-parking"></i> Book Now
{% else %}
<button class="btn btn-secondary btn-sm w-100" disabled>
<i class="fas fa-times"></i> No spots available
</button>
{% endif %}
</div>
</div>
</div>
{% endfor %}
</div>
{% else %}
<div class="text-center py-4">
<i class="fas fa-building fa-3x text-muted mb-3"></i>
<h5>No parking lots available</h5>
Please check back later.
</div>
{% endif %}
{% else %}
<div class="alert alert-info">
```

```
i class="fas fa-info-circle"></i> You already have an active reservation. Please release your current
parking spot before booking a new one.
</div>
{% endif %}
</div>
</div>
</div>
</div>
<!-- User Parking Statistics Chart -->
<div class="row mb-4">
<div class="col-12">
<div class="card">
<div class="card-header bg-info text-white">
<h5><i class="fas fa-chart-bar"></i> Your Parking Usage Statistics</h5>
</div>
<div class="card-body">
<canvas id="userHistoryChart" width="400" height="200"></canvas>
<div id="userHistoryChartEmpty" class="text-center py-4" style="display: none;">
<i class="fas fa-chart-bar fa-3x text-muted mb-3"></i>
<h6>No parking history available</h6>
Your parking usage statistics will appear here after you complete parking
sessions.
</div>
</div>
</div>
</div>
</div>
<div class="row">
<div class="col-12">
<div class="card">
<div class="card-header">
<h5><i class="fas fa-history"></i> Your Parking History</h5>
</div>
<div class="card-body">
{% if reservation_history %}
<div class="table-responsive">
<thead>
Location
Spot
```

```
Vehicle
Parked
Released
Duration
Cost
</thead>
{% for reservation, spot, lot in reservation_history %}
{{ lot.prime_location_name }}
{{ spot.spot_number }}
{{ reservation.vehicle_number }}
{{ reservation.parking_timestamp.strftime('%Y-%m-%d %H:%M') }}
{% if reservation.leaving_timestamp %}
{{ reservation.leaving_timestamp.strftime('%Y-%m-%d %H:%M') }}
{% else %}
{% endif %}
{% if reservation.leaving_timestamp %}
{% set duration = (reservation.leaving_timestamp - reservation.parking_timestamp).total_seconds() /
3600 %}
{{ "%.1f"|format(duration) }} hours
{% else %}
{% endif %}
{% if reservation.parking_cost %}
₹{{ "%.2f"|format(reservation.parking_cost) }}
{% else %}
{% endif %}
{% endfor %}
</div>
{% else %}
<div class="text-center py-4">
```

```
<i class="fas fa-history fa-3x text-muted mb-3"></i>
<h5>No parking history</h5>
Your parking reservations will appear here.
{% endif %}
</div>
</div>
</div>
</div>
<script src="https://cdn.jsdelivr.net/npm/chart.js"></script>
// User Parking History Chart (Bar Chart)
async function loadUserHistoryChart() {
try {
const response = await fetch('/api/user/parking-history-chart-data');
const data = await response.json();
const ctx = document.getElementById('userHistoryChart').getContext('2d');
if (data.labels.length === 0 || data.data.every(value => value === 0)) {
document.getElementById('userHistoryChart').style.display = 'none';
document.getElementById('userHistoryChartEmpty').style.display = 'block';
return;
const backgroundColors = [
'#36A2EB', '#4BC0C0', '#FFCE56', '#FF6384',
'#9966FF', '#FF9F40', '#FF6384', '#C9CBCF'
new Chart(ctx, {
type: 'bar',
data: {
labels: data.labels,
datasets: [{
label: 'Times Parked',
data: data.data,
backgroundColor: backgroundColors.slice(0, data.labels.length),
borderColor: backgroundColors.slice(0, data.labels.length),
borderWidth: 1
}]
options: {
responsive: true,
maintainAspectRatio: false,
scales: {
```

```
y: {
beginAtZero: true,
ticks: {
stepSize: 1
plugins: {
title: {
display: true,
text: 'Total Parking Sessions: ' + data.data.reduce((a, b) => a + b, 0)
legend: {
display: false
tooltip: {
callbacks: {
label: function(context) {
return 'Parked ' + context.parsed.y + ' time(s)';
} catch (error) {
console.error('Error loading user history chart:', error);
document.getElementById('userHistoryChart').style.display = 'none';
document.getElementById('userHistoryChartEmpty').style.display = 'block';
// Load chart when page loads
document.addEventListener('DOMContentLoaded', function() {
loadUserHistoryChart();
});
{% endblock %}
```

<u>Book_parking.html:</u>

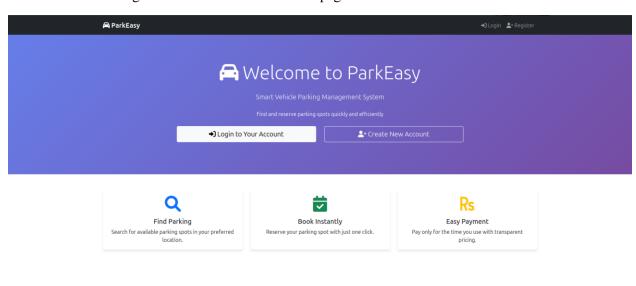
{% extends "base.html" %}

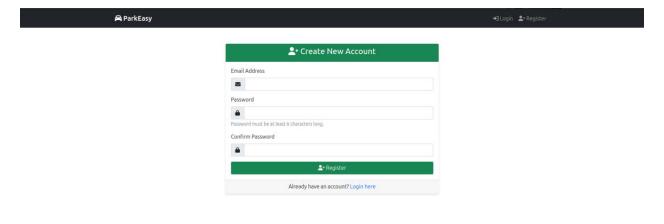
```
{% block title %}Book Parking - Vehicle Parking System{% endblock %}
{% block content %}
<div class="container py-5">
<div class="row justify-content-center">
<div class="col-md-8">
<div class="card">
<div class="card-header bg-primary text-white text-center">
<h4><i class="fas fa-parking"></i> Book Parking Spot</h4>
</div>
<div class="card-body">
<div class="row">
<div class="col-md-6">
<h5>Parking Lot Details</h5>
<div class="mb-3">
<strong>Location:</strong> {{ parking_lot.prime_location_name }}
</div>
<div class="mb-3">
<strong>Address:</strong> {{ parking_lot.address }}
</div>
<div class="mb-3">
<strong>Pin Code:</strong> {{ parking_lot.pin_code }}
</div>
<div class="mb-3">
<strong>Price per Hour:</strong> ₹{{ parking_lot.price }}
</div>
<div class="mb-3">
<strong>Available Spots:</strong> {{ parking_lot.available_spots_count }}
</div>
</div>
<div class="col-md-6">
<h5>Vehicle Information</h5>
<form method="POST">
<div class="mb-3">
<label for="vehicle_number" class="form-label">Vehicle Number *</label>
<div class="input-group">
<span class="input-group-text"><i class="fas fa-car"></i></span>
<input type="text" class="form-control" id="vehicle_number"</pre>
name="vehicle_number" placeholder="e.g., TN01AB1234"
pattern="[A-Za-z0-9]{4,15}" title="Vehicle number should be 4-15 characters long" required>
</div>
<div class="form-text">Enter your vehicle registration number</div>
</div>
```

```
<div class="alert alert-info">
<i class="fas fa-info-circle"></i>
<strong>Note:</strong> Once you confirm booking, the first available parking spot will be assigned to
you automatically.
</div>
<div class="d-grid gap-2">
<button type="submit" class="btn btn-success btn-lg">
<i class="fas fa-check"></i> Confirm Booking
</button>
<a href="{{ url_for('user_dashboard') }}" class="btn btn-secondary">
<i class="fas fa-arrow-left"></i> Back to Dashboard
</div>
</div>
</div>
</div>
</div>
</div>
</div>
</div>
{% endblock %}
```

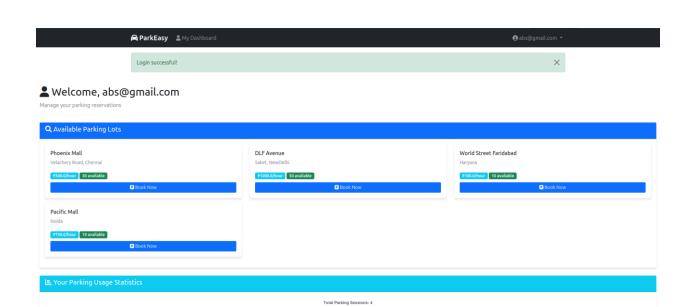
SCREENSHOTS:

The following are the screenshots of the webpage:





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'S Your Parking History

Location	Spot	Vehicle	Parked	Released	Duration	Cost
World Street Faridabad	1	TN06Q5699	2025-09-18 11:40	2025-09-18 11:41	0.0 hours	₹100.00
DLF Avenue	1	TN06Q5699	2025-09-18 11:39	2025-09-18 11:39	0.0 hours	₹1000.00
Phoenix Mall	1	TN06Q5699	2025-09-18 11:37	2025-09-18 11:37	0.0 hours	₹500.00
Phoenix Mall	1	HR51BR7392	2025-07-06 14:27	2025-07-06 14:28	0.0 hours	₹50.00

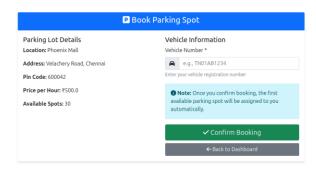
DLF Avenue

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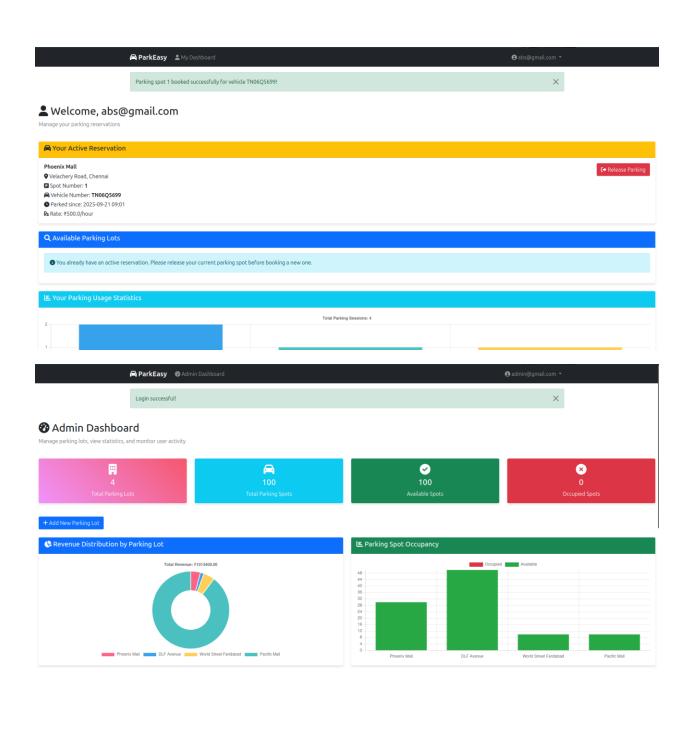
ParkEasy 2 My Dashboard

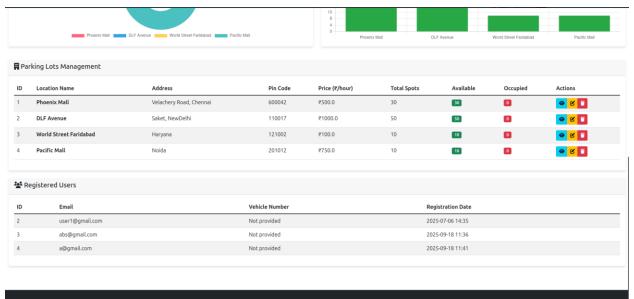
⊕ abs@gmail.com ▼

World Street Faridabad



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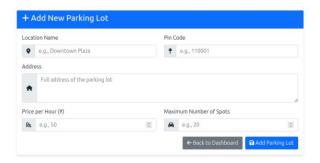




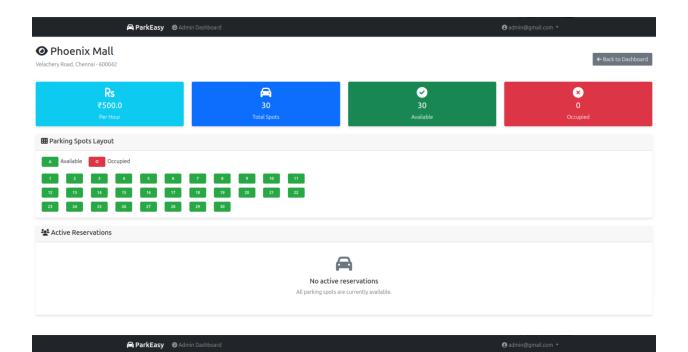
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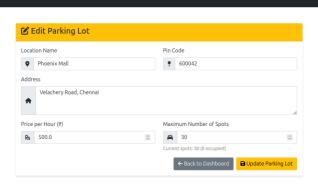
ParkEasy @ Admin Dashboard

A admin@gmail.com *



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