# Final Year Project Proposal

Project Title: Car Rental Portal Web Application

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# Introduction1.1

# Background :

The automotive rental industry is rapidly transitioning from traditional, in-person bookings to digital, self-service platforms. In today's market, customers expect instant access to vehicle inventory, transparent pricing, and seamless booking experiences accessible via desktop and mobile devices. A modern Car Rental Portal is essential for businesses to streamline operations, reduce manual errors, and compete effectively by offering a superior online presence.

# 1.2 Problem Statement

Many small to medium-sized car rental businesses rely on fragmented or outdated management systems, leading to double-bookings, inefficient inventory tracking, and a poor user experience. The problem is the lack of an integrated, real-time, user-friendly portal that manages both the customer-facing booking process and the administrative inventory control efficiently and securely.

# 1.3 Purpose of the Project

The purpose of this project is to develop a complete, full-stack Car Rental Portal Web Application that can:Provide customers with a simple, secure platform to browse, compare, and book vehicles.Offer administrators a dedicated dashboard for efficient vehicle inventory, pricing, and booking management.Automate the rental process from initial search to confirmation, reducing operational overhead.

# 2. Objectives

# 2.1 Primary Objectives

Design and develop a secure, responsive, full-stack web application (customer-facing and admin dashboard).Implement robust user authentication for both customers (registration/login) and administrative staff.Provide real-time inventory management, allowing administrators to add, modify, and track the availability status of all vehicles.Develop a secure booking system that reserves vehicles and updates inventory instantly upon successful booking.

# 2.2 Secondary Objectives

Integrate a search and filtering mechanism based on vehicle type, price, seating capacity, and availability date.Integrate a payment gateway sandbox (e.g., Stripe/PayPal test mode) to simulate secure transaction processing.Generate comprehensive reports for administrators (e.g., total bookings, revenue by vehicle type, availability forecast).

# 3. Scope of the Project

# 3.1 In Scope

Development of a multi-user application: Customer Module and Admin Module.Detailed vehicle catalog with images, specifications, and dynamic pricing.Complete booking lifecycle (Search, Selection, Checkout, Confirmation).Administrative dashboard for managing vehicles, pricing, and bookings.Implementation of responsive UI/UX for all screen sizes.

# 3.2 Out of Scope

Integration of a live, production-ready payment gateway (only sandbox environment will be used).Complex features like multi-branch location management.Real-time GPS tracking or on-board telematics integration.Development of a native mobile application (focusing solely on the web portal).

# 4. Literature Review

The review will focus on current trends in e-commerce and reservation systems, examining:Database Design for Inventory: Analyzing best practices for handling time-series availability data to prevent concurrent booking conflicts.Web Security Standards (Authentication & Authorization): Reviewing technologies like JWT/session management for securing user and admin routes.UI/UX of Leading Rental Platforms: Studying the user journey and design patterns of major players (e.g., Avis, Enterprise) to ensure an intuitive user experience.

# 5. Methodology

# 5.1 System Architecture

The application will follow a three-tier architecture:Frontend (Presentation Layer): User interface developed using React.js for a modern and responsive user experience.Backend (Application Layer): RESTful API built with Python Flask to handle business logic, data validation, and authentication.Database (Data Layer): MySQL will be used for reliable, structured storage of user data, vehicle inventory, and booking records.

# 5.2 Process FlowSearch:

Customer enters dates/location via the Frontend.API Call: Frontend calls the Backend API to query the Database for available vehicles.Booking: Customer selects a vehicle and proceeds to checkout.Transaction: Customer details and rental period are sent to the Backend for processing and inventory update.Confirmation: Booking status is updated, and a confirmation is displayed to the user and recorded in the Database.

# 5.3 Tools and Technologies

CategoryTool / LibraryPurposeProgramming LanguagePython, JavaScriptBackend logic and Frontend interactivity.Frontend FrameworkReact.jsBuilding the user interface components.Backend FrameworkFlask (Python)API development and server-side logic.DatabaseMySQL / FirebaseStructured storage of application data.StylingTailwind CSSUtility-first CSS framework for rapid, responsive design.

# 6. Expected Outcomes

A fully functional and aesthetically pleasing Car Rental Portal that is usable on all modern browsers and devices.A secure administrative dashboard for complete control over the car inventory and all active/past bookings.Robust and tested API endpoints for all core functions (Search, Book, Authenticate, Manage).Detailed project documentation including database schema, API specification, and deployment instructions.

# 7. Significance of the Project

This project holds significant value as it:Provides a real-world, functional solution for a high-demand business sector, demonstrating commercial viability.Showcases expertise in full-stack development, covering database design, secure API creation, and modern frontend development.Contributes to operational efficiency by automating tasks that are traditionally time-consuming and error-prone.

# 8. Limitations

The system’s success depends on the completeness and accuracy of the initial vehicle inventory data entered by the administrator.Transaction security is limited to the functionality provided by the integrated sandbox payment environment.The initial focus will be on core features; advanced logistics (e.g., location-based pricing) are reserved for future work.

# 9. Future Enhancements

Live Payment Gateway: Transitioning from the sandbox to a live payment processor (Stripe, SSLCommerz).ML Integration: Implementing machine learning models for demand forecasting and dynamic pricing optimization based on season and inventory levels.User Reviews and Ratings: Adding a system for customers to review rented vehicles.Push Notifications: Integrating email/SMS notifications for booking confirmations and pick-up reminders.

# 9: Project Plan and Timeline:

Phase Description Duration

Phase 1 Requirements Analysis, UI/UX Wireframing, Database Schema Design 3 Weeks

Phase 2 Backend API Development, Authentication & Inventory Endpoints 4 Weeks

Phase 3 Frontend Portal Development, Integration with Backend, Sandbox Payment 4 Weeks

Phase 4 Integration Testing, Bug Fixing, Security Audits 2 Weeks

Phase 5 Final Documentation and Report Generation 2 Weeks|

Total Duration 15 weeks