



PUSL3190 Computing Individual Project

Project Proposal

Vehicle Garaj Management System - VGMS

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Introduction to Vehicle Garaj Management System

In today's fast-paced world, effective management of vehicle service centers and garages is essential to meet the growing demand for maintenance and repair services. Traditional manual processes can often lead to inefficiencies, delays, and errors in scheduling, inventory tracking, and customer management. To address these challenges, the Vehicle Garage Management System aims to provide a digital solution that streamlines the operations of automotive service centers, ensuring better service delivery, optimized workflows, and enhanced customer satisfaction.

This project proposes the development of a comprehensive Vehicle Garage Management System that will automate key processes such as appointment scheduling, mechanic assignment, parts management, and payment tracking. By leveraging modern technologies, the system will facilitate seamless communication between customers, mechanics, and administrators, minimizing human errors and improving service quality. It will also offer features like secure data handling, role-based access control, and automated notifications to ensure smooth operations and secure transactions.

The system's online appointment booking functionality will allow customers to schedule vehicle maintenance or repair services at their convenience. Automatic scheduling and mechanic assignments will optimize workload distribution, ensuring that the right personnel are allocated efficiently. In addition, the system will maintain detailed vehicle records, including make, model, and service history, enabling quick access to past repair data and enhancing transparency.

Inventory management is another key aspect of the system. The stock tracking module will monitor the availability of genuine parts and consumables, providing alerts for low-stock levels and helping administrators manage supplier relationships. Customers can also purchase and book parts online, with real-time stock visibility for better decision-making. Payment tracking, invoice generation, and status updates on ongoing repairs will be accessible to both customers and administrators, improving transparency and financial management.

The notification system will keep all stakeholders informed through SMS and email alerts, reminding customers about upcoming appointments, overdue services, or pending payments, and notifying mechanics of their assignments. Moreover, the system will generate insightful reports on revenue, service trends, and part usage, assisting administrators in making data-driven business decisions.

To ensure data security and reliability, the system will incorporate encrypted logins, password hashing, and role-based access control. Only authorized users, such as admins, will have access to sensitive data like financial reports. Periodic backups will be performed to prevent data loss, with the option to restore the system in case of failure.

The user management feature will facilitate the registration and login of customers and staff, with access tailored to specific roles. Feedback collection from customers will further help service providers evaluate and improve their offerings. Overall, the Vehicle Garage Management System will modernize the way garages operate, enhancing both operational efficiency and customer satisfaction.

This solution will ultimately provide a centralized, automated, and secure platform that reduces manual effort, minimizes errors, and creates a positive experience for customers and staff alike. With these features, the system aims to contribute to the growth and long-term sustainability of vehicle service centers by improving workflow efficiency and providing superior service quality.

Chapter 01

Problem Statement

In today's competitive automotive service industry, many garages still rely on outdated or manual methods to manage their operations. These inefficiencies lead to various challenges that negatively affect customer satisfaction, workflow efficiency, and the overall business performance of vehicle service centers. Below are the key problems faced by most garages and service centers, highlighting the need for an Automated Vehicle Garage Management System.

1. Inefficient Appointment Booking

Garages often manage appointments manually through phone calls or in-person visits, which increases the risk of scheduling conflicts, double bookings, or missed appointments. This manual system also creates an inconvenient experience for customers, who may need to wait or reschedule services, leading to frustration and dissatisfaction.

2. Poor Mechanic Assignment and Scheduling

Without a proper scheduling system, managers find it difficult to allocate tasks effectively among available mechanics. This can result in overloaded mechanics or underutilization of staff, causing delays in repair work and reducing service quality. The absence of automated task assignment also hinders productivity and affects the timely completion of jobs.

3. Lack of Vehicle Service History

Many garages maintain vehicle records on paper or in disorganized spreadsheets, making it challenging to track the service history of vehicles. Without access to past maintenance and repair data, mechanics may miss critical information, leading to diagnostic errors or repeated repairs. This inefficiency wastes time, increases costs, and impacts customer trust.

4. Limited Communication with Customers and Mechanics

Manual processes often lead to poor communication between customers, administrators, and mechanics. Customers may not receive timely updates about the status of repairs, upcoming appointments, or overdue payments. Similarly, mechanics might not get clear notifications about their tasks, resulting in missed deadlines and delays in repairs.

5. Manual Invoicing and Payment Tracking

Tracking payments and generating invoices manually can cause errors and confusion over payment statuses, leading to delayed payments or even unpaid bills. Customers may not have clear visibility into their invoices, and the lack of automated reminders can increase the risk of overdue payments. This impacts cash flow and operational efficiency.

6. Vehicle Parts Stock Management Issues

Garages face challenges in managing their spare parts inventory, such as running out of essential parts or overstocking items that take up space and tie up capital. Without real-time stock tracking, managers cannot predict replenishment needs effectively, which can lead to service delays when critical parts are unavailable.

7. Inaccurate Financial Reporting

Manual tracking of income and expenses can result in inaccurate financial records and missed opportunities for business analysis. Many garages struggle to assess their performance through reports, such as revenue trends, most common services, and high-value customers. This lack of visibility makes it difficult for managers to make informed decisions.

8. Data Loss and Poor Backup Management

Garages without proper data backup strategies are vulnerable to data loss due to technical failures, accidents, or cyberattacks. Important customers, vehicles, and financial data can be lost permanently, leading to significant operational setbacks and customer dissatisfaction.

9. Security and Unauthorized Access Issues

Many garages do not implement proper security protocols, such as data encryption and role-based access control. As a result, sensitive data such as customer information and financial records may be exposed to unauthorized users or vulnerable to cyberattacks. This puts both the business and its customers at risk.

10. Inability to Collect Customer Feedback and Improve Service

Most garages lack a structured way to collect feedback from customers about their service experience. Without this data, it becomes challenging to identify service gaps and make necessary improvements. Missing out on customer feedback also reduces opportunities to enhance the overall customer experience and foster loyalty.

Chapter 02

Project Description

❖ Overview

The Vehicle Garage Management System is designed as an integrated software solution to streamline the management processes within a vehicle service center. The system will automate essential garage operations, including online appointment scheduling, mechanic task allocation, service tracking, inventory management, payment processing, and secure data handling. With the rapid increase in vehicle service demands and customer expectations for efficient service, this project seeks to address the limitations of traditional manual systems by providing a comprehensive digital platform that simplifies workflows and enhances service quality. The Vehicle Garage Management System will be accessible to customers, mechanics, and administrators, each with tailored access privileges for efficient operation and data protection.

❖ Project Aim

The primary aim of this project is to develop an advanced Vehicle Garage Management System that will automate core operations of a vehicle service center, reducing manual work, minimizing errors, and improving the overall customer experience. By creating a secure, user-friendly, and efficient management tool, the project aims to optimize day-to-day activities, improve resource utilization, and enhance transparency between customers and service providers. The goal is to equip garages with a modern solution that not only streamlines internal processes but also facilitates customer engagement through convenient online booking, notifications, and real-time service tracking.

❖ Project Objectives

- Develop an Online Appointment Booking System

Enable customers to conveniently book service and repair appointments online, view available slots, and receive booking confirmations in real-time.

- Automate Mechanic Assignment and Scheduling

Implement a system for automatic scheduling and assignment of mechanics based on workload and skill, ensuring balanced task allocation and timely service.

- Provide a Service Work Calendar for Admin View Only

Allow only admins to view the full work calendar for efficient planning, tracking, and task management.

- Vehicle Record Maintenance

Store comprehensive vehicle information (e.g., make, model, year, identification number) to streamline service history tracking and quick information retrieval.

- Track Service and Repair History

Maintain a complete service and repair history for each vehicle, including past repairs and inspections, to facilitate better diagnostics and personalized service.

- **Monitor Ongoing Repair Status**

Track and display the current status of ongoing repairs (e.g., in-progress, completed) to provide transparency to both mechanics and customers.

- **Integrate Genuine Parts Inventory and Online Booking**

Allow customers to view, book, and purchase genuine parts online while ensuring real-time stock updates.

- **Payment Tracking and Invoice Generation**

Provide an interface for customers and admins to view payment statuses (pending/paid) and generate invoices automatically for completed services and parts purchases.

- **Automate Notifications and Reminders**

Send SMS and email reminders for appointments, overdue services, and payments, as well as assignment notifications to mechanics.

- **Generate Revenue and Inventory Reports**

Produce daily, weekly, or monthly revenue reports, identify vehicle service trends, and track inventory usage for informed decision-making.

- **Collect Customer Feedback and Ratings**

Allow customers to submit feedback and rate service quality to help admins monitor service standards and customer satisfaction.

- **Implement User Management with Role-Based Access**

Provide secure user management for customer and staff registration and role-based access for admins, mechanics, and customers to protect sensitive data.

- **Efficient Stock Tracking and Low-Stock Alerts**

Track stock levels of spare parts and consumables, send low-stock alerts, and assist with supplier management and replenishment planning.

- **Ensure Data Security and Access Control**

Protect sensitive data through data encryption, password hashing, and restricted access for financial reports, limiting visibility to admins only.

- **Enable Data Backup and Restoration**

Implement periodic data backups with restoration options to prevent data loss due to system failure or accidental deletion.

❖ **Scope of the System**

The Vehicle Garage Management System will serve as a web-based platform accessible to three main user groups: customers, mechanics, and administrators. The primary focus of the system will be on core garage functions, including service scheduling, inventory management, payment tracking, and reporting. Key functionalities like online booking, mechanic scheduling, and part inventory management will facilitate seamless garage operations, while role-based access will ensure secure handling of sensitive data.

The scope of the system excludes advanced diagnostic integration with vehicle systems and external vehicle-related software applications. Instead, the system will focus on automating traditional management tasks within garages, streamlining operational workflows, and offering features that enhance customer convenience. Additionally, the system will provide built-in data security measures and regular backups to safeguard against data loss.

❖ Key Features

1. Online Appointment Booking
 - Allows customers to book appointments for repairs and services at their convenience.
 - Displays available dates and times in real-time, reducing booking conflicts.
2. Automated Mechanic Scheduling and Task Allocation
 - Assigns tasks to mechanics automatically based on availability, skill, and current workload, optimizing resource use.
3. Admin Work Calendar
 - A centralized calendar view restricted to admins for tracking upcoming and ongoing jobs, facilitating effective planning.
4. Vehicle Record Management
 - Stores and organizes vehicle details, enabling easy access to past service data for diagnostics and personalized recommendations.
5. Service History Tracking
 - Records the service and repair history of each vehicle, allowing quick reference for mechanics and administrators.
6. Repair Status Updates
 - Displays the progress of ongoing repairs, giving customers and admins visibility into the current status of each job.
7. Genuine Parts Inventory and Online Booking
 - Allows customers to check stock availability and book genuine parts, while providing stock tracking for admins.
8. Payment Tracking and Invoicing
 - Automates payment status updates (paid/pending) and generates invoices for completed jobs and parts sales.
9. Automated Notifications and Reminders
 - Sends timely SMS/email reminders for appointments, payments, and mechanic assignments, enhancing communication and reducing missed appointments.
10. Revenue and Inventory Consumption Reports
 - Generates daily, weekly, and monthly reports on revenue, frequent services, parts usage, and inventory levels, helping admins make data-driven decisions.

11. Customer Feedback and Ratings

- Collects customer feedback on service quality, enabling continuous service improvement.

12. User Management and Role-Based Access Control

- Provides role-based access for customers, mechanics, and admins, protecting sensitive data and limiting access to authorized users only.

13. Stock Alerts and Supplier Management

- Tracks inventory levels, issues low-stock alerts, and assists with supplier orders, maintaining optimal stock levels.

14. Data Security and Access Control

- Implements data encryption, password hashing, and limited access to financial reports, ensuring data protection.

15. Data Backup and Restoration

- Performs regular data backups and provides restoration options to prevent data loss and maintain data reliability.

❖ Technology Stack

To ensure scalability, security, and performance, the system will employ a reliable technology stack:

1. Frontend:

- HTML, CSS, JavaScript for basic layout and styling.
- React.js or Angular for creating a dynamic, responsive user interface.

2. Backend:

- Node.js with Express for handling server requests and building APIs.
- REST API to enable communication between frontend and backend services.

3. Database:

- MySQL or MongoDB for storing structured data, including customer information, vehicle records, and service history.

4. Authentication and Security:

- JWT (JSON Web Tokens) for user authentication.
- BCrypt for password hashing to ensure secure logins.

5. Notifications:

- Twilio or SendGrid for SMS/email notifications.

6. Hosting and Deployment:

- AWS, Azure, or Digital Ocean for scalable cloud deployment.
- Git and GitHub for version control.

7. Data Backup:

- Automated Backup Services for regular data backups and secure storage.

❖ Challenges and Considerations

1. Data Security and Privacy Compliance
 - Implementing robust security features, such as encryption and access control, to protect sensitive data.
2. Efficient and Balanced Mechanic Scheduling
 - Designing an algorithm to automatically balance mechanic workloads and optimize service timelines.
3. Inventory Accuracy and Low-Stock Alerts
 - Ensuring accurate stock tracking and alerting admins promptly when parts reach low stock levels.
4. Real-Time Notifications Without Delays
 - Selecting reliable notification services to ensure timely delivery of appointment, payment, and assignment reminders.
5. User-Friendly Interface
 - Designing an intuitive interface that balances usability with functionality, allowing seamless navigation for all users.
6. Scalability and Performance Optimization
 - Ensuring the system can handle increased load as the garage grows, optimizing backend and database performance for responsiveness.
7. Collecting and Utilizing Customer Feedback
 - Implementing a feedback system that encourages honest customer reviews and uses insights to improve service quality continuously.

Chapter 03

Research Gap

1. Limited Customization for Small to Medium-Sized Garages

- Existing Solutions: Many garage management systems are designed for large automotive service centers, which often makes them overly complex and costly for small to medium-sized garages. These smaller garages may not require extensive enterprise-level features.
- Research Gap: There is a need for a scalable, modular system that starts with essential features and allows for expansion. Small to medium-sized garages would benefit from an adaptable solution that focuses on efficiency, simplicity, and cost-effectiveness, which most existing systems do not provide.

2. Lack of Real-Time Communication and Notification Features

- Existing Solutions: Research shows that communication is key to customer satisfaction, yet most garage management systems lack integrated, real-time notification features (like SMS/email reminders). Customers are often left without status updates on repairs, leading to miscommunication.
- Research Gap: Current systems often overlook the importance of automated notifications and reminders for appointments, repairs, and payment updates. An integrated notification system in the Vehicle Garage Management System can improve transparency and communication, helping to reduce missed appointments and increase customer satisfaction.

3. Insufficient Mechanic Scheduling and Task Allocation Automation

- Existing Solutions: Mechanic scheduling and task assignments are usually handled manually or with basic tools, resulting in inefficient resource utilization. This leads to unbalanced workloads, missed deadlines, and reduced productivity.
- Research Gap: There is a need for an automated scheduling feature that can assign tasks based on each mechanic's availability, skills, and workload. Implementing this in the Vehicle Garage Management System would improve efficiency by distributing tasks more evenly and ensuring that each mechanic is properly utilized.

4. Deficiencies in Inventory and Parts Management

- Existing Solutions: Inventory management for garages, particularly in smaller businesses, often lacks real-time tracking, resulting in frequent stock shortages or overstock situations. This creates delays in service, increases costs, and affects customer satisfaction.
- Research Gap: Most current systems fail to offer comprehensive inventory management with low-stock alerts and real-time tracking. The Vehicle Garage Management System will address this by integrating a genuine parts inventory module that allows customers to view available stock and book parts, ensuring that critical parts are always on hand.

5. Limited Financial Tracking and Reporting

- Existing Solutions: Many garage management systems provide only basic financial tracking, making it difficult for small business owners to monitor revenue, manage expenses, or analyze trends.
- Research Gap: There is a need for a more detailed financial tracking module that can generate daily, weekly, and monthly reports, providing insights into revenue, inventory usage, and customer behavior. This level of detail will help administrators make informed, data-driven decisions for business growth.

6. Lack of Secure Role-Based Access Control and Data Protection

- Existing Solutions: Some garage management systems do not provide sufficient security features, such as role-based access control or encryption, leaving sensitive customer and financial data vulnerable.
- Research Gap: As data privacy concerns continue to grow, there is a significant gap in providing secure data management and restricted access based on user roles (admin, mechanic, customer). Implementing robust data protection and access control in the Vehicle Garage Management System will protect customer data and enhance security.

7. Absence of Customer Feedback Collection and Analysis

- Existing Solutions: Customer feedback is essential for maintaining service quality, but many existing systems lack a structured way to collect and analyze feedback.
- Research Gap: There is an opportunity to integrate a feedback collection and rating feature within the Vehicle Garage Management System. This will enable garages to gather insights into customer satisfaction, identify areas for improvement, and tailor services based on customer needs.

Chapter 04

Requirements Analysis

In developing the Vehicle Garage Management System, specific requirements related to technical skills, tools, and potential devices must be considered. This chapter addresses functional requirements (actions the system must perform), non-functional requirements (performance and security standards), and knowledge requirements (skills or tools needed for development). This analysis ensures the system will be developed effectively, securely, and with minimal gaps in user needs.

Functional Requirements

The functional requirements specify essential features and actions the system must support for efficient garage management.

1. Online Appointment Booking
 - Customers can book service or repair appointments through an online interface.
 - Functionality: Displays available time slots, allows customers to choose preferred dates/times, and confirms bookings in real time.
2. Mechanic Scheduling and Assignment
 - Automatically schedules and assigns tasks to mechanics based on availability, workload, and skills.
 - Functionality: Ensures balanced work allocation to optimize productivity and minimize delays.
3. Admin Work Calendar
 - Provides a centralized calendar view accessible only to admins.
 - Functionality: Allows admins to view and manage scheduled tasks, track progress, and organize workload efficiently.
4. Vehicle Record Management
 - Maintains a detailed database of vehicle information, including make, model, year, and VIN.
 - Functionality: Supports fast access to vehicle history for diagnostics and service planning.
5. Service and Repair History Tracking
 - Keeps a comprehensive record of each vehicle's service and repair history.
 - Functionality: Helps mechanics and admins track previous issues, repairs, and inspections for accurate servicing.
6. Real-Time Repair Status Updates
 - Tracks and displays ongoing repair statuses, such as “in-progress” or “completed.”
 - Functionality: Increases transparency by allowing customers and admins to view current repair progress.
7. Genuine Parts Inventory and Booking
 - Provides an online inventory of genuine parts for customers to view and book.
 - Functionality: Displays real-time stock levels and updates availability, reducing service delays due to parts shortages.
8. Payment Tracking and Invoicing
 - Automates the tracking of payments and generates invoices for services and parts.

- **Functionality:** Displays payment statuses (e.g., pending, paid) and issues invoices upon service completion.

9. Notification and Reminder System

- Sends automated SMS/email reminders for appointments, overdue services, and payments.
- **Functionality:** Improves communication, reducing missed appointments and keeping customers informed.

10. Financial Reporting and Analytics

- Generates revenue, service trend, and inventory usage reports.
- **Functionality:** Provides insights into financial performance, common repairs, and customer trends to support data-driven decisions.

11. Customer Feedback Collection

- Allows customers to submit feedback and rate service quality.
- **Functionality:** Collects ratings and feedback for admins to assess and improve service quality.

12. User Management and Role-Based Access Control

- Manages user roles with specific access rights (admins, mechanics, customers).
- **Functionality:** Limits access to sensitive data based on roles, ensuring data security.

13. Inventory Tracking and Low-Stock Alerts

- Monitors inventory levels and issues alerts when stock is low.
- **Functionality:** Notifies admins to restock in time, preventing service interruptions.

14. Secure Login and Data Encryption

- Provides secure user authentication with encrypted passwords and data.
- **Functionality:** Ensures data protection through password hashing and secure login protocols.

15. Data Backup and Restoration

- Regular data backups with restoration options in case of failure.
- **Functionality:** Protects data integrity and provides recovery options to prevent data loss.

Non-Functional Requirements

Non-functional requirements ensure the system operates reliably, securely, and with optimal performance.

1. Usability

- **Requirement:** The system must be intuitive for all users.
- **Standard:** Simple, user-friendly interface requiring minimal training for customers, mechanics, and admins.

2. Performance and Scalability

- **Requirement:** The system must perform efficiently and scale with increased data and users.
- **Standard:** Response times should be under 2 seconds, with scalability to accommodate a growing garage.

3. Reliability and Availability

- **Requirement:** High availability and reliability are essential for operational continuity.

- Standard: System should maintain at least 99% uptime, providing continuous access to data and services.
4. Security and Data Protection
 - Requirement: Protect sensitive data, ensuring confidentiality.
 - Standard: Implement SSL, encryption, password hashing, and role-based access to prevent unauthorized data access.
 5. Compatibility
 - Requirement: System should work across multiple devices and platforms.
 - Standard: Accessible on desktops, tablets, and smartphones, compatible with major operating systems.
 6. Data Backup and Disaster Recovery
 - Requirement: Regular backups with recovery options.
 - Standard: Perform daily or weekly backups with a disaster recovery plan to restore data quickly.

Required Knowledge and Special Devices

The project requires knowledge in key areas and specific tools to ensure the system is functional, secure, and user-friendly.

Technical Knowledge Requirements

1. Frontend Development Skills
 - Languages: HTML, CSS, JavaScript
 - Frameworks: React.js or Angular for creating an interactive and responsive user interface.
2. Backend Development Skills
 - Languages: JavaScript (Node.js)
 - Frameworks: Express for server-side processing and RESTful API setup for frontend-backend communication.
3. Database Management
 - Databases: MySQL or MongoDB for structured storage of vehicle data, user information, and service records.
 - Skills: Querying, schema design, and data structuring to support efficient storage and retrieval.
4. Authentication and Security Practices
 - Knowledge of: JWT (JSON Web Tokens) for secure login, BCrypt for password encryption, and role-based access to protect sensitive data.
5. API Integration Skills
 - Third-Party Services: Integration with Twilio or SendGrid for SMS/email notifications.
 - Optional: Knowledge of payment gateway integration (e.g., PayPal or Stripe) for online transactions.

6. Data Analysis and Reporting
 - Tools: Data visualization libraries like D3.js or Chart.js for generating financial, service, and inventory reports.
7. Cloud Computing and Deployment
 - Platforms: AWS, Azure, or Digital Ocean for hosting, managing backups, and providing a scalable infrastructure.
 - Skills: Server setup, database management, and backup configuration for secure deployment.

Special Devices and Tools

1. Development Environment
 - Hardware: High-performance computer with 16GB RAM and SSD for efficient coding and testing.
 - Software: Git and GitHub for version control, ensuring organized, collaborative development.
2. Testing Devices
 - Multi-Device Compatibility: Access to desktops, tablets, and mobile devices (across iOS, Android, Windows) to ensure system compatibility.
 - Debugging Tools: Chrome Developer Tools, Postman for API testing, and Browser Stack for cross-platform compatibility.
3. Data Encryption and Security Tools
 - SSL Certificates: Required for secure data transmission and encryption for sensitive information protection.
4. UI/UX Design Tools
 - Tools: Figma or Adobe XD for designing mockups and layouts, ensuring a user-friendly experience.

Learning Requirements

1. Data Security and Privacy Compliance
 - Knowledge of encryption, password protection, and role-based access control to protect sensitive data.
2. User-Centric Design Principles
 - Training in UI/UX design to create a simple and intuitive interface that improves the user experience for customers, mechanics, and admins.
3. Agile Development Practices
 - Familiarity with Agile methodologies for organizing tasks, iterative development, and effective project management.
4. Disaster Recovery and Data Backup
 - Learning best practices for data backup, recovery, and maintaining data integrity during unexpected issues.

Chapter 05

Budget Plan

Item	Description	Estimated Cost
Frontend Development	React.js (open-source)	LKR 0
Backend Development	Node.js with Express (open-source)	LKR 0
Database Management	MySQL (Community Edition, free)	LKR 0
API Testing Tool	Postman (basic plan)	LKR 0
Version Control	Git and GitHub (free public repositories)	LKR 0
UI/UX Design Tools	Figma (free trial)	LKR 0
Notification Services	Twilio (basic plan)	LKR 0
SSL Certificate	For secure data transmission over the internet (Free from hosting)	LKR 0
Data Backup Services	Cloud-based storage backup	LKR 0
Hosting and Deployment Cloud platform	Cloud platform	LKR 3,200 - 9,600 per month

Subtotal : Approximately LKR 3,200 - 9,600 per month

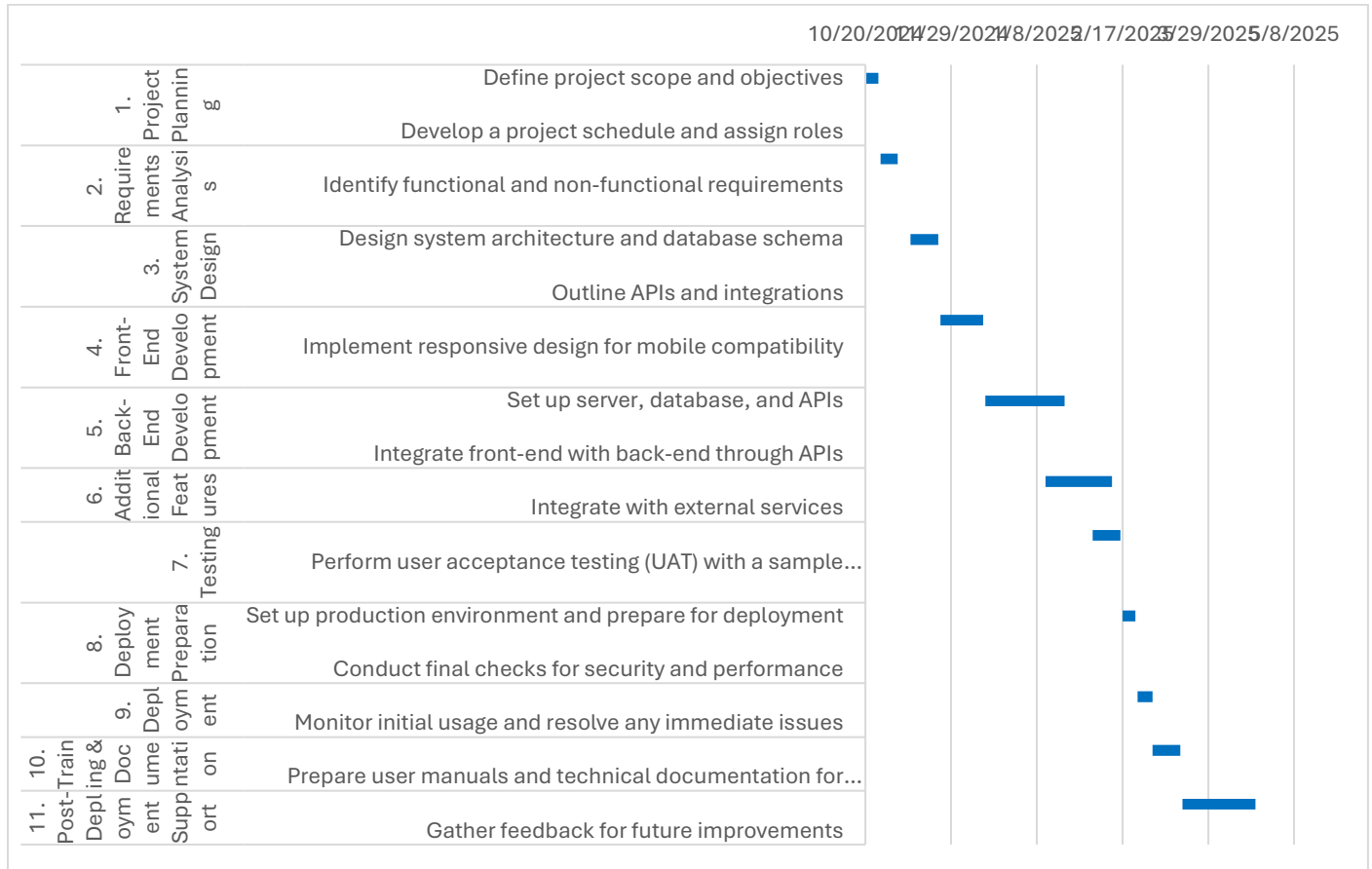
Chapter 06

Timeline

❖ Project Timeline

Phase	Task	Start Date	Day to Complete	End Date
1. Project Planning	Define project scope and objectives	10/20/2024	6	10/26/2024
	Identify key requirements and create initial project documentation			
	Develop a project schedule and assign roles			
2. Requirements Analysis	Conduct detailed requirements analysis with stakeholders	10/27/2024	8	11/4/2024
	Identify functional and non-functional requirements			
	Draft requirements specification document			
3. System Design	Design system architecture and database schema	11/10/2024	13	11/23/2024
	Create wireframes and user interface (UI) mockups for core features			
	Outline APIs and integrations			
4. Front-End Development	Develop front-end UI components	11/24/2024	20	12/14/2024
	Implement responsive design for mobile compatibility			
	Create pages for user roles, service management, and vehicle records			
5. Back-End Development	Set up server, database, and APIs	12/15/2024	37	1/11/2025
	Implement core functionality			
	Integrate front-end with back-end through APIs			
6. Additional Features	Implement additional features	1/12/2025	31	2/2/2025
	Integrate with external services			
7. Testing	Conduct unit testing and integration testing for all modules	2/3/2025	13	2/16/2025
	Perform user acceptance testing (UAT) with a sample user group			
	Debug and refine based on feedback			
8. Deployment Preparation	Set up production environment and prepare for deployment	2/17/2025	6	2/23/2025
	Ensure data migration (if applicable)			
	Conduct final checks for security and performance			
9. Deployment	Launch the Garage Management System in a live environment	2/24/2025	7	3/2/2025
	Monitor initial usage and resolve any immediate issues			
10. Training & Documentation	Train end users and provide system documentation	3/3/2025	13	3/16/2025
	Prepare user manuals and technical documentation for future maintenance			
11. Post-Deployment Support	Monitor system performance and address any post-launch issues	3/17/2025	34	4/20/2025
	Gather feedback for future improvements			

❖ Project Gantt Chart



Chapter 07

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