Mini Project – Summary

Title of the Project	**Smart Car Parking System**
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Class	III CSE

Problem Statement:

Urban areas and campuses face a common issue of limited parking spaces and inefficient parking management. Traditional parking systems do not provide real-time information about space availability, leading to time loss, traffic congestion, and user frustration.

Objective:

To design and implement a smart car parking system that uses sensors and real-time data to detect parking slot availability and guide users to vacant spots, reducing search time, fuel consumption, and traffic load.

Scope:

- Detect available and occupied parking slots using ultrasonic or IR sensors.
- Display real-time availability through a mobile app or web dashboard.
- Use cloud integration for data logging and analytics.
- Send alerts or notifications to users when a slot becomes available.
- Future scope includes slot reservation, license plate recognition, and payment integration.

Innovations Compared to Existing Systems:

- **Real-time Slot Monitoring:** Accurate, sensor-based availability updates.
- **Mobile Application:** Easy-to-use interface for users to check and navigate to available slots.
- **Cloud-Enabled Analytics:** Analyze peak hours and optimize parking usage.

- **Energy Efficiency:** Solar-powered system (optional for outdoor parking areas).
- **Dynamic Guidance:** Guide vehicles to nearest available slots via mobile app.

Social Relevance :

This system reduces traffic congestion and fuel wastage caused by manual searching for parking. It enhances urban mobility and user convenience while supporting sustainable development goals by minimizing idle vehicle emissions.

Technology Stack: (sample)

1. Hardware Components:

- Microcontroller: Arduino Uno / ESP32
- Sensors: Ultrasonic or IR sensors (to detect vehicle presence)
- Communication Module: Wi-Fi (ESP8266/ESP32) or GSM (SIM800L)
- Display Unit (optional): LCD/LED for on-spot slot availability
- Power Supply: Solar Panel with Battery Backup (for outdoor use)

2. Software Components:

• **Programming Languages:**

  - Embedded C (for Arduino)
  - Python (for backend analytics,)

• **Mobile App / Dashboard Development:**

  - MIT App Inventor / Android Studio (for a simple mobile app)
  - Firebase (for cloud-based real-time database)

• **Data Analytics:**

  - Python (for predictive analytics - libraries like Pandas, Scikit-learn for basic models)

3. Communication Protocols:

• MQTT or HTTP (for IoT communication if using Wi-Fi)

4. Cloud Services (Optional for Scaling Up):

• Google Firebase (for real-time database)

Work plan:

Date	Task	Details
Apr 29, 2025	**Project Initiation & Planning**	Define project scope and finalize components
Apr 30, 2025 - May 2, 2025	**Hardware Setup and Component Procurement**	Procure components and test sensors
May 3, 2025 - May 5, 2025	**Software Development**	Develop sensor integration and basic code. Create mobile app/dashboard.
May 6, 2025 - May 7, 2025	**Integration & Testing**	Integrate system and test real-time slot detection
May 8, 2025	**Predictive Analytics & Optimization**	Implement basic analytics (usage trends)
May 9, 2025	**Final Testing & Documentation**	Final testing and report writing
May 10, 2025	**Project Presentation & Submission**	Final presentation and submission