# Project Document: Autonomous Vehicles and Robotics Using Design Thinking

## Project Title:

Enhancing Urban Mobility and Logistics with Autonomous Vehicles and Robotics

## Objective:

To develop innovative, human-centered autonomous vehicle and robotics solutions that improve transportation efficiency and urban logistics through the Design Thinking process.

## 1. Empathize

Goal: Understand user needs, operational contexts, and technological limitations in autonomous systems.

Activities:

- Interview urban commuters, logistics company operators, and city planners.

- Observe current traffic patterns, delivery processes, and safety procedures.

- Study regulations and policies affecting autonomous systems.

- Analyze public perceptions and concerns about robotics and self-driving vehicles.

Insights:

- Commuters seek safer, more reliable, and environmentally-friendly transportation options.

- Logistics operators face last-mile delivery challenges and labor shortages.

- Public trust in autonomous systems is low, largely due to safety concerns.

- Regulatory compliance and ethical design are major hurdles.

## 2. Define

Problem Statement:

Urban residents and logistics providers face inefficiencies, safety concerns, and environmental impacts that current transportation systems struggle to address without leveraging autonomous technologies.

User Personas:

- Commuter Persona: Alex, 32, city dweller, frustrated by traffic congestion, open to autonomous transit.

- Logistics Persona: Priya, 45, fleet manager for a delivery company seeking automation to cut costs and improve delivery times.

## 3. Ideate

Brainstorming Sessions:

- Self-driving shuttle pods for short urban trips.

- Autonomous delivery robots for sidewalks and campuses.

- AI-based fleet routing and monitoring systems.

Concepts Generated:

- Modular Autonomous Pod (MAP) that adapts for passenger or cargo use.

- Sidewalk Robot Assistant (SRA) with real-time obstacle avoidance.

- Urban Mobility Dashboard (UMD) for city planners and logistics operators.

## 4. Prototype

Low-Fidelity Prototypes:

- 3D-printed models of the MAP and SRA.

- Digital wireframes of the UMD interface.

- Simulated environments for vehicle-path testing.

Tools Used:

- Tinkercad for 3D modeling

- Figma for UI prototyping

- Unity for simulation testing

## 5. Test

User Testing Approach:

- Public demonstrations of the MAP in controlled environments.

- Pilot test of SRA on university campuses.

- UMD interface feedback from city planners and logistics managers.

Key Findings:

- MAP was well-received for accessibility and modularity.

- SRA needed improvements in terrain handling and weather resistance.

- UMD users requested real-time alerts and predictive traffic analytics.

## Next Steps:

- Develop full-scale prototypes and seek regulatory clearance.

- Partner with local governments for pilot deployments.

- Monitor performance metrics: safety incidents, delivery times, energy usage, and user satisfaction.