Course Syllabus: Autonomous AI Systems Engineer

Course Title: Building Self-Driving Intelligence: Autonomous AI Systems

Target Audience: Ideal for engineers, developers, and students interested in autonomous AI for robotics, vehicles, or smart systems. Basic programming (e.g., Python) and interest in automation are helpful but not required.

Course Level: Comprehensive program covering Basic, Intermediate, and Advanced levels.

Duration: 12 weeks (flexible for self-paced learning).

Course Description:
This course trains students to become Autonomous AI Systems Engineers, designing AI for self-operating systems like delivery robots for Zomato's Blinkit. You'll learn to build AI that perceives, decides, and acts autonomously, integrating sensors, machine learning, and control systems. From foundational robotics to advanced autonomous navigation, you'll create systems that operate independently in real-world environments.

Learning Objectives:

Upon completion, students will be able to:

- Understand autonomous AI systems and their components.
- Process sensor data (e.g., cameras, LIDAR) for AI decision-making.
- Design and train AI models for autonomous tasks.
- Integrate AI with robotics and control systems.
- Address safety and ethical issues in autonomous AI.
- Develop a portfolio of autonomous AI projects.

Course Structure:

Part 1: Basic Foundations (Weeks 1-4)

This section introduces autonomous AI and robotics basics.

- Week 1: Introduction to Autonomous AI
    - What is autonomous AI? Perception, decision, action.
    - Role of an Autonomous AI Systems Engineer.
    - Examples: Delivery robots for Zomato's Blinkit.
    - Exercise: Explore a simulation of an autonomous system.
- Week 2: Sensor Data Processing
    - Sensors: Cameras, LIDAR, ultrasonic for autonomy.
    - Tools: ROS (Robot Operating System), OpenCV.
    - Hands-on: Process camera data for object detection.
- Week 3: Machine Learning for Autonomy
    - ML for perception: Classification, object detection.
    - Frameworks: TensorFlow, PyTorch for autonomous tasks.
    - Exercise: Train a model to recognize obstacles.
- Week 4: Control Systems Basics
    - Control systems: PID controllers, path planning.
    - Simulating autonomous movement.
    - Hands-on Project: Build a simple autonomous navigation simulation.

Part 2: Intermediate Concepts (Weeks 5-8)

This section focuses on building and testing autonomous AI systems.

- Week 5: Advanced Perception
    - Combining sensors: Sensor fusion for robust perception.
    - Techniques: Kalman filters, SLAM (Simultaneous Localization and Mapping).
    - Hands-on: Implement SLAM for a delivery robot.

- Week 6: Decision-Making in AI
    - Reinforcement learning for autonomous decisions.
    - Tools: OpenAI Gym, RLlib.
    - Case Study: Route optimization for Zomato’s delivery robots.
- Week 7: System Integration
    - Integrating AI with robotics: Hardware-software interfaces.
    - Tools: ROS, Gazebo for simulation.
    - Hands-on: Build an integrated autonomous system prototype.
- Week 8: Testing and Validation
    - Testing autonomous systems: Simulation, real-world trials.
    - Metrics: Safety, accuracy, reliability.
    - Hands-on Project: Test an autonomous AI system for navigation.

Part 3: Advanced & Expert-Level Application (Weeks 9-12)

This section prepares students for enterprise-grade autonomous AI.

- Week 9: Advanced Autonomous Models
    - Deep reinforcement learning, imitation learning.
    - Multimodal perception: Vision, audio, sensors.
    - Exercise: Build a model for autonomous delivery navigation.
- Week 10: Real-World Deployment
    - Deploying autonomous AI: Edge devices, cloud integration.
    - Tools: NVIDIA Jetson, AWS RoboMaker.
    - Hands-on: Deploy an autonomous AI system on edge hardware.
- Week 11: Safety and Ethics
    - Safety in autonomous systems: Fail-safes, redundancy.
    - Ethical issues: Privacy, accountability in autonomous AI.
    - Exercise: Design a safety protocol for an autonomous system.

- Week 12: Capstone Project & Trends
    - Capstone Project: Develop an autonomous AI system for a Zomato-like delivery platform (e.g., a food delivery robot).
    - Trends: Swarm robotics, autonomous drones.
    - Career paths: Robotics engineering, autonomous vehicle development.

Assignments & Grading:

- Weekly Coding & Simulation Labs: 25%
- Intermediate Projects (Weeks 4 & 8): 30%
- Capstone Project: 35%
- Class Participation & Peer Reviews: 10%