Electric Vehicle (EV) Technology – 32 Hours (Detailed Curriculum)

Course Description

This program provides in-depth knowledge of Electric Vehicles, including architecture, battery systems, motor control, charging infrastructure, and simulations. It is designed for engineers and trainers aiming to build expertise in EV systems.

Course Objectives

1. Understand EV architecture and system design
2. Analyze battery technologies and BMS
3. Explain motor control techniques
4. Understand EV charging infrastructure
5. Perform simulations and diagnostics

Prerequisites

Basic knowledge of Electrical/Electronics, Embedded Systems, and Motors.

Module 1: Introduction to EV (4 Hours)

1. History and evolution of EVs
2. Types of EVs (BEV, HEV, PHEV)
3. EV vs ICE comparison
4. Basic EV architecture

Learning Outcomes

1. Identify EV types
2. Understand EV components

Module 2: EV Powertrain & Components (6 Hours)

1. EV powertrain structure
2. Motors: BLDC, PMSM, Induction
3. Inverters and converters

4. Control strategies

Learning Outcomes

1. Analyze EV powertrain
2. Understand power electronics

Module 3: Battery & BMS (8 Hours)

1. Battery types and chemistry
2. SOC, SOH concepts
3. Battery pack design
4. BMS architecture
5. Cell balancing and safety

Learning Outcomes

1. Understand battery systems
2. Explain BMS functions

Module 4: Charging Infrastructure (4 Hours)

1. Charging levels
2. Charging standards
3. On-board vs off-board chargers
4. Smart charging

Learning Outcomes

1. Understand charging systems
2. Identify standards

Module 5: Motor Control & Embedded Systems (6 Hours)

1. PWM techniques
2. FOC control
3. Embedded controllers
4. Sensors and feedback

Learning Outcomes

1. Understand motor control
2. Explain embedded role

Module 6: Simulation & Case Studies (4 Hours)

1. MATLAB/Simulink basics
2. EV modeling
3. Diagnostics
4. Case studies

Learning Outcomes

1. Perform simulations
2. Analyze EV systems