

ELECTRIC VEHICLE SOFTWARE DEVELOPMENT

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SUMMARY

This 30-hour online course is designed for Diploma & Bachelor's students and professionals who want to build a strong foundation in Electric Vehicle (EV) technology and Software Development.

- The course covers EV fundamentals, Powertrain, Battery management, Charging infrastructure, Battery Swapping, Maintenance & Repair, EV Software Development, and job opportunities in the EV industry. In addition, learners will explore advanced topics like solar-powered EVs, hydrogen fuel cell technology and autonomous EVs, along with real-world case studies of five major EVs.
- The program includes assignments, quizzes, and hands-on virtual training, ensuring that NPTEL certified participants are well-equipped to enter the EV industry.

COURSE DETAILS

Course Name	Electric Vehicle Software Development
Course Structure	10 Modules Duration: 30 Hours Mode: Online Level: Intermediate
Assessment	Final assessment will be conducted separately to validate learning
Target Audience	Diploma & Bachelor's Students and Professionals
Prerequisites	Basic knowledge on Electrical, Electronics, Physics, Mechanics, Computer Programming, Interest in Automotive Technology & Sustainability

COURSE MODULES

Module 1: Introduction to Electric Vehicles	3 hours
<ul style="list-style-type: none">• History & Evolution of Electric Vehicles• Types of Electric Vehicles (BEV, HEV, PHEV, FCEV)• EV Market Trends & Future Scope• Basic Working Principle of an EV• Key Components of an EV (Motor, Battery, Controller, Charger, etc.)• Comparison: EV vs ICE (Internal Combustion Engine) Vehicles• Assignment & Quiz	

<p>Module 2 : EV Powertrain & Motor Technology</p> <ul style="list-style-type: none"> • EV Powertrain Architecture • Types of Motors Used in EVs (BLDC, PMSM, Induction Motors, etc.) • Motor Efficiency & Performance Analysis • Motor Controllers & Inverters in EVs • Regenerative Braking System • Case Study: Tesla's Powertrain vs Indian EVs • Assignment & Quiz 	<p>3 hours</p>
<p>Module 3: Battery Technology & Battery Management System (BMS)</p> <ul style="list-style-type: none"> • Battery Chemistry (Li-ion, LFP, NMC, Solid State, etc.) • Battery Design & Manufacturing Process • Battery Charging & Discharging Cycles • State of Charge (SOC) & State of Health (SOH) Calculation • Thermal Management of Batteries • Safety and Protection Mechanisms in BMS • Case Study: Tesla vs Ather Battery Technology • Assignment & Quiz 	<p>3 hours</p>
<p>Module 4: Charging Infrastructure & Charging Management</p> <ul style="list-style-type: none"> • Types of EV Chargers (AC, DC, Fast Charging, Wireless Charging) • Charging Station Infrastructure & Standards (CCS, CHAdeMO, GB/T, Bharat EV Charger) • Grid Integration & Load Management for EV Charging • Smart Charging & V2G (Vehicle to Grid) Technology • Solar-powered Charging for EVs • Case Study: Tesla Supercharger vs Indian Charging Networks • Assignment & Quiz 	<p>3 hours</p>
<p>Module 5: Battery Swapping Technology</p> <ul style="list-style-type: none"> • Concept of Battery Swapping • Advantages & Challenges of Swapping • Global vs Indian Battery Swapping Policies & Market • Battery Standardisation for Swapping • Case Study: Ola Battery Swapping & Gogoro Swapping Model • Assignment & Quiz 	<p>3 hours</p>
<p>Module 6: EV Maintenance, Repair & Safety</p> <ul style="list-style-type: none"> • Common EV Issues & Troubleshooting • Motor & Controller Issues • Battery Fault Detection & Repair • Software Issues & Diagnostics • Safety & Emergency Handling in EVs • Hands-on Virtual Training & DIY EV Repair • Assignment & Quiz 	<p>3 hours</p>

Module 7: EV Software Development & IoT	3 hours
<ul style="list-style-type: none"> • Introduction to EV Software Development (CAN, IoT, BMS Software, etc.) • Motor Control & Powertrain Software Basics • Battery Simulation & Software Testing • IoT & AI in Electric Vehicles • Cloud-based Vehicle Diagnostics • Case Study: Smart Features in Tesla & Ather 450X • Assignment & Quiz 	
Module 8: EV Companies & Job Opportunities	3 hours
<ul style="list-style-type: none"> • Top EV Companies in India & Globally (Tesla, Tata, Ola, Ather, Rivian, BYD, etc.) • Skills Required to Enter the EV Industry • Job Roles & Salary Expectations in EV Industry • EV Startups – How to Build Your Own EV Company? • Government Policies & Subsidies for EV Startups • Assignment & Quiz 	
Module 9: Case Studies of 5 Vehicles	3 hours
<ul style="list-style-type: none"> • Tesla Model 3 – Battery, Charging & Performance Analysis • Ola Electric Scooter – Battery Swapping & Software • Tata Nexon EV – Battery & BMS Case Study • Ather 450X – Performance, Motor & Charging System • Mercedes EQS – Advanced EV Features & Market Trends • Assignment & Quiz 	
Module 10: Advanced Topics – Solar-Powered EVs & Future Technologies	3 hours
<ul style="list-style-type: none"> • Solar-Powered EV Design & Integration • Fuel Cell Electric Vehicles (FCEV) – Hydrogen Fuel Cell Technology • Wireless Charging & Dynamic Charging Roads • Autonomous & AI-Driven EVs • Solid-State Batteries & Future of Battery Tech • Case Study: Aptera Solar Car & Toyota Mirai FCEV • Assignment & Quiz 	
Final Assessment	2 hours
<ul style="list-style-type: none"> • Final Test Covering All Modules (Objective + Case Study Based) • Project Submission: EV System Design TOBE DONE • Live Q&A and Expert Panel Discussion 	

OPPORTUNITIES

Why take this course?

- Learn from industry experts and real-world case studies
- Gain practical skills with assignments, quizzes, and hands-on virtual training
- Open doors to high-demand EV job roles & startup opportunities

Career Opportunities

- EV Engineer & Battery Specialist
- EV Charging & Infrastructure Specialist
- EV Software Developer
- EV Maintenance & Service Engineer