



CODE IIT Madras offers

E-MOBILITY LAB **COMPONENT - EVENING PROGRAM**

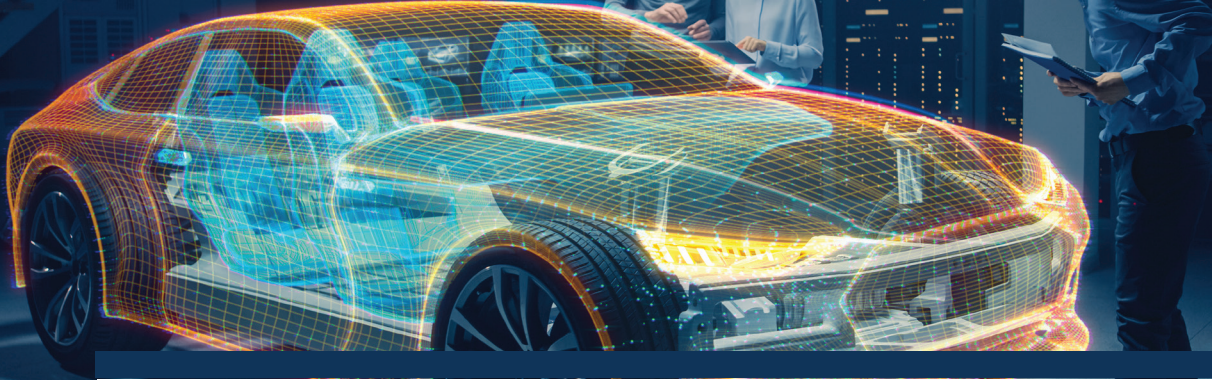
<https://code.iitm.ac.in/>



Course Fee:
Rs.12,000 + GST



S.No	Name of the experiments	Description	No. of hours
1	Electric Vehicle Drivetrain - Electric Two-wheeler disassembly to study the parts and assemblies	<ul style="list-style-type: none">• Understand the basics of two/three-wheeler and analyze powertrain Components• To identify and document the major electrical, electronic, and mechanical components.• To study the integration and physical mounting of key subsystems like the battery, motor, and controller.• To trace the power and signal flow through the wiring harness and connectors.• To create a subsystem-wise topology map showing physical layout and interconnections.	2
2	Onboard diagnostics using CAN data logger	<ul style="list-style-type: none">• Gain insights into the role of the CAN bus in electric vehicles for monitoring and diagnosing performance metrics• CAN data logging tools and their setup for real-time data acquisition and analysis• To log and analyze real-time vehicle parameters using CAN data logger	2
3	Comparative Study of ICE Engine and Electric Motor using Dynamometer	<ul style="list-style-type: none">• To measure and compare torque, power, and efficiency characteristics of an ICE engine and an electric motor.• To analyze the torque-speed and power-speed characteristics under controlled loading.• To evaluate energy input vs. mechanical output for both propulsion systems.	2



S.No	Name of the experiments	Description	No. of hours
4	Simulation case studies <ul style="list-style-type: none"> • EV Powertrain • Battery Thermal management • Motor Control 	<ul style="list-style-type: none"> • To analyze the complete EV powertrain, including battery, motor, controller, and drivetrain under standard drive cycles. • To simulate temperature rise in battery cells and packs under various load and ambient conditions. • To implement motor control algorithm 	2
5	Control Strategy of Electric Motors (HIL approach of testing motor and drive)	<ul style="list-style-type: none"> • To develop and implement real-time control algorithms for BLDC motors using Snetley FPGA 	2
6	Battery cell Testing and study of BMS	<ul style="list-style-type: none"> • To understand the characteristics of individual battery cells • To study the operation and functions of a Battery Management System (BMS) 	2

LEARNING OUTCOME:

By the end of this laboratory course, learners will be able to:

- Understand the architecture and integration of EV subsystems through hands-on disassembly of electric two/three-wheelers.
- Identify and document key mechanical, electrical, and electronic components in an EV drivetrain.
- Trace power and signal flow using wiring harnesses and create subsystem topology maps.
- Measure and compare performance parameters (torque, power, efficiency) of ICE and electric motors using a dynamometer.
- Set up and use CAN data loggers to capture real-time vehicle parameters and interpret diagnostic information.
- Simulate EV powertrain, battery thermal behavior, and motor control strategies using software tools.
- Implement and validate motor control strategies (e.g., FOC) using real-time Hardware-in-the-Loop (HIL) platforms like Snetley FPGA.
- Characterize individual battery cells and analyze Battery Management System (BMS) functions such as monitoring, balancing, and protection.



INDUSTRY APPLICATIONS:

Skills gained in this lab are useful in:

- a) **EV Design and Integration:** Understanding component packaging, wiring, and system-level interactions in electric two- and three-wheelers.
- b) **Diagnostics and Service Engineering:** Real-time fault detection, CAN-based diagnostics, and troubleshooting for EVs.
- c) **Powertrain Benchmarking and Validation:** Comparative performance evaluation of propulsion systems (EV vs. ICE) using dynamometer data.
- d) **Model-Based Development:** Use of simulation tools for virtual prototyping and control development for battery, motor, and thermal systems.
- e) **Motor and Drive Control Development:** FPGA- and HIL-based testing of motor control logic for production-ready embedded systems.
- f) **Battery and BMS Testing:** Evaluation of energy storage systems and BMS performance for safety, efficiency, and reliability in EV applications.



CONTACT US

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