

## **ABOUT AUTOBOT INDIA:**

AUTOBOT INDIA (ABI) is a leading service provider company offering solutions in powertrain design, integration and EV engineering to the mainstream automobile, education, and motorsports. ABI aims to bring the state-of-art in powertrain system design and engineering offers high-level tailor-made services as per the client's requirements.

### **MISSION & VISION:**

To establish One Stop Solution Platform (OSP) for the industries in powertrain design and EV engineering.

To make India a prominent R&D destination by supporting and offering cutting-edge world-class services and technology solutions.

### **COURSE INTRODUCTION:**

Two weeks professional training program for the undergraduate students to learn and upgrade their skills to make more lucrative understanding of EV powertrain, working principles and its integration of 2w/3w/4w electric vehicles.

This program is highly specialized in the area of innovative powertrain of electric vehicle using the different industrial tool and various demonstration. Participants will learn the importance of electro-mechanics, battery storage, regenerative braking system, the design of machine elements and material implementing the calculation and electro-mechanics parameters & magnitudes.

Our training programs follow the practical approach of learning with the aim to train the engineers for the industrial workforce demand, and skill development under the guidance of our decorated trainers, and industry professionals.

### **WHO CAN PARTICIPATE?**

- The program is designed for B.E./B.Tech/Diploma – Automobile, Mechanical, Electrical, Electronics, Industrial and Production Engineering students
- Diploma Engineers interested in pursuing further studies on the part-time or full-time basis in Automotive, Electrical, Electronics, and Mechanics sector.

COURSE CODE	COURSE NAME	COURSE DURATION	LEVEL
ABI – EV15	ELECTRIC VEHICLE POWERTRAIN & INTEGRATION	70 HOURS	ACADEMIC
<b>PREREQUISITE:</b> <ul style="list-style-type: none"> <li>Basics of Automobile, Motors, Controllers, basic physics &amp; mechanics</li> </ul>			
<b>SYLLABUS:</b> <i>Introduction to electric vehicle, Introduction to electric drivetrain, electric motors, motor controller and it's working, design &amp; selection mythology of motors, introduction to batteries, battery pack design, battery management systems, wire harness design, comparison between Japanese and Indian drivetrain technology, latest trends in electric vehicle, ASI standards, vehicle design, vehicle development and vehicle endurance.</i>			
<b>LEARNING OUTCOME:</b> Candidates will learn: <ul style="list-style-type: none"> <li>Design and development of efficient lithium battery pack with different size and utility.</li> <li>Choose suitable drivetrain technology for Indian electric automobile technology.</li> <li>Design and development of vehicle chassis, battery pack design and electric vehicle.</li> <li>Testing, troubleshooting and endurance of electric Vehicle</li> </ul>			
<b>METHODS:</b> <ul style="list-style-type: none"> <li>Autobot India follows 70% practical &amp; 30% theory methodology where we focus on maximum hands on practical learning approach (PLA).</li> <li>Theories by industry practitioners who has expertise into electric vehicle design &amp; development.</li> </ul>			
<b>TIME DISTRIBUTION:</b> <ul style="list-style-type: none"> <li>Everyday consumes 2 sessions with 2.5 hours/session and 1 hour break time</li> </ul>			

**COURSE PLAN**

MODULE	HEADLINES	CONTENTS	HOURS
M1	<b>TYPES OF MOTORS USED IN EVs &amp; HOW THEY WORK</b>	Brushless DC Motor, AC Induction Motor, Permanent magnet, Synchronous Motor, Axial Flux motors, Comparison of Various Motor Types	6
M2	<b>MOTOR CONTROLLER AND ITS WORKING</b>	BLDC Motor Control, Switch Configuration, Pulse width Modulation, Single Phase BLDC Motor, Three Phase BLDC Motor, Sensorless Control of BLDC Motor, AC motor control and winding configuration, AC motor controller systems, Motor controller and regenerative braking	6 4
M3	<b>DESIGN AND SELECTION METHODOLOGY FOR MOTORS</b>	Classification of motors based on application, Demonstration on electric motors, coupling a motor with gearbox, Design calculation for motor combined with gearbox and vehicle performance, Motor type, power rating in various existing electric vehicles like truck, buses, cars etc. High voltage, low current system or Low voltage High current system?	6
M4	<b>OVERVIEW OF EV BATTERY SYSTEMS</b>	Lead acid battery, Flow battery, Lithium ion, Lithium iron phosphate, Lithium titanate oxide	3
M5	<b>BATTERY PACK DESIGN</b>	Prismatic and cylindrical cells, Cell combinations, Series and parallel connections, Cell holder/structures, Battery management system design, Active balancing and Passive balancing, Overview of BMS functions, Overview of BMS/Battery test parameters, Battery thermal management system, Overview of where & why BTMS required, Overview of Thermal management technology, Overview of mechanical enclosure customization/Design, SOC determination methods and their efficiency, Power management in EVs	3 5
M6	<b>ON-BOARD CHARGERS AND EVSE</b>	How an on-board EV rectifier system works, Constant Current/ Constant Voltage characteristics, EVSE (Electric Vehicle Supply Equipment) - Wall mounted and public EV charger, Handshaking and current negotiation, SAE J1772 protocol, IEC 62196 protocol	6

M7	<b>WIRE HARNESS DESIGN</b>	High current and low current connectors, IP ratings of automotive connectors, Glands used in Enclosures, Automotive Fuses used in Electric Vehicles, Contactors used in Electric vehicles	4
M8	<b>LOW VOLTAGE CONNECTIONS</b>	Buck converter system 12V application wiring schematics and relay usage Throttle and brake types	4
M9	<b>COMPLIANCE AND APPROVAL STANDARDS</b>	ARAI, ITAC standards for equipment and hardware approval AIS standards like AIS 038, 039, 040, 041, 048, 049	3
M10	<b>ELECTRIC VEHICLE INTEGRATION</b>	Electric vehicle integration, demonstration and troubleshooting	18

### **CERTIFICATION:**

All the participating students will be given “Certificate of Participation” and “Certificate of Training” will be issued according to assessment terms and conditions.