

ABOUT AUTOBOT INDIA:

AUTOBOT INDIA (ABI) is a leading company offering consultancy in design and engineering to the mainstream Automobile, education, and motorsports. ABI aims to bring the state-of-art design and engineering with disruptive technology and offers high-level tailor-made services as per the client's requirements. ABI also offers wide spectrum of design and development consultancy services catering to various domains like E-mobility, Robotics, Automation, AI and Machine Learning, and in Green energy storage system.

MISSION & VISION:

To establish One Stop Solution Platform (OSP) for the undergraduates, entrepreneurs and industries in design and engineering. To make India as prominent R&D destination by supporting and offering cutting-edge world-class services and technology solutions.

COURSE INTRODUCTION:

The 30 days professional certification training program for the undergraduate engineers, innovators, automation & electric vehicle aspirants who are bound to learn and upgrade their skills to make more lucrative understanding of design and development of EV, working principals focusing to design & manufacturing of two-seater e-vehicle (prototype) by your own hands.

This program is highly specialized in the area of innovation, design, development, and analysis of electric vehicle using the different industrial tool and various software for designing and analysis. Participants will learn the importance of electro-mechanics, battery storage, regenerative braking system, the design of machine elements and material implementing the calculation in CAD/CAE software 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
- Automotive enthusiasts (undergraduate & passed out).
- Anyone having the passion for Automobiles and Electric Vehicle and Saving Environment.
- 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 | YEAR OF INTRODUCTION |
|-------------|---------------------------------------|-----------------|----------------------|
| ABI – EV15 | ELECTRIC VEHICLE DESIGN & DEVELOPMENT | 180 HOURS | 2017 |

PREREQUISITE:

- Basics of Automobile, Motors, Controllers, CAD/CAM, basic physics & mechanics

SYLLABUS:

Introduction to electric vehicle, Introduction to electric drivetrain, electric motors, motor controller and it's working, design & 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.

LEARNING OUTCOME:

Candidates will learn:

- Design and development of efficient lithium battery pack with different size and utility.*
- Choose suitable drivetrain technology for Indian electric automobile technology.*
- Design and development of vehicle chassis, battery pack design and electric vehicle.*
- Testing, troubleshooting and endurance of electric Vehicle*

TEXT BOOKS:

- Handbooks will be provided by Autobot India*

METHODS:

- Autobot India follows 70% practical & 30% theory methodology where we focus on maximum hands on practical learning approach (PLA).
- Theories by industry practitioners who has expertise into electric vehicle design & development.

TIME DISTRIBUTION:

- Everyday consumes 2 sessions with 2.5 hours/session and 1 hour break time
- Total course contains 150 hours for training and 30 hours for break time

COURSE PLAN

| MODULE | HEADNILES | CONTENTS | HOURS |
|--------|------------------|---|-------|
| M1 | CHASSIS/ROLLCAGE | Overall vehicle development discussion on all sub-systems i.e. chassis, suspension, steering, brakes, battery, controllers, motors, transmission, in order to brief students about the complete training program flow. | 6 |
| | | Overall vehicle configuration and target technical specifications for complete vehicle, Parameters to be considered for Chassis design, Identification of members of roll cage and their uses, Demonstration of Chassis design in SolidWorks and discussion on subsequent integration with other systems. | 6 |

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|----|--|--|-----------------------|
| | | <p>Fundamentals of practical finite element analysis, Types of analysis in CAE, CAE-preprocessing using Hypermesh, Demonstration of CAE analysis using Hypermesh, optistruct and Radioss software tools and explanation on prototype also.</p> <p>Design validation plan for Chassis, Manufacturing related aspects of Chassis, Testing of Chassis for validation, General failures in Chassis.</p> | 6 6 |
| M2 | SUSPENSION, STEERING AND BRAKES | <p>Why there is requirement of suspension and types of suspension design, Explanation of suspension design parameters like camber, caster, KPI etc. Suspension kinematics (Roll center, motion ratio etc.), Design parameters for front and rear suspension selection, Target specifications for front suspension.</p> <p>Design of front view geometry, 2D geometric analysis in solidworks, Demonstration of front suspension system in SolidWorks (This will include control arms, uprights, hub etc.</p> <p>Target specifications for rear suspension, Design of rear view geometry, 2D geometric analysis in solidworks</p> <p>Demonstration of rear suspension system in SolidWorks, Wheel loads, Longitudinal dynamics with calculations, Lateral dynamics with calculations.</p> <p>Why steering is required and types of steering, Steering kinematics, Target specifications for steering, Design of steering geometry and calculations.</p> <p>Demonstration of steering system in Solidworks, Various types of braking systems, Brake related calculations, Demonstration of braking systems in Solidworks, Design validation plan of braking systems.</p> <p>Testing of suspension, steering and brakes</p> | 6 6 6 6 6 |
| M3 | TYPES OF MOTORS USED IN EVs & HOW THEY WORK | Brushless DC Motor, AC Induction Motor, Permanent magnet, Synchronous Motor, Axial Flux motors, Comparison of Various Motor Types | 3 |
| M4 | MOTOR CONTROLLER AND ITS WORKING | BLDC Motor Control, Switch Configuration, Pulse width Modulation, Single Phase BLDC Motor, Three Phase BLDC Motor, Sensor-less Control of BLDC Motor, AC motor control and winding configuration, Vector control/ Field oriented control method, AC motor controller systems, Motor controller and regenerative braking | 6 6 |

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|-----|--|--|-------------|
| M5 | DESIGN AND SELECTION METHODOLOGY FOR MOTORS | 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? | 5 |
| M6 | OVERVIEW OF EV BATTERY SYSTEMS | Lead acid battery, Flow battery, Hydrogen fuel cell, Lithium ion, Lithium iron phosphate, Lithium titanate oxide | 3 |
| M7 | BATTERY PACK DESIGN | 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(Algorithms/coding), 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, How to track down each and every ampere with power management circuits. | 3 5 3 |
| M8 | ON-BOARD CHARGERS AND EVSE | 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, IEC62196 protocol, Chademo fast charging | 5 |
| M9 | WIRE HARNESS DESIGN | CAN bus architecture for in-vehicle data transmission, CAN for charging: CHADEMO protocol, Connectors used for harness design and their classification, 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 | 3 3 |
| M10 | LOW VOLTAGE CONNECTIONS | Buck converter system 12V application wiring schematics and relay usage Throttle and brake types | 3 |
| M11 | COMPLIANCE AND APPROVAL STANDARDS | ARAI, ITAC standards for equipment and hardware approval AIS standards like AIS 038, 039, 040, 041, 048, 049 | 3 |
| M12 | ELECTRIC VEHICLE ENDURANCE | Electric vehicle manufacturing, testing, troubleshooting and endurance | 45 |

CERTIFICATION:

All the participating students will be given “Certificate of Participation” and 5 students will get “Certificate of Appreciation” (on basis of an assessment & Interview taken at the end of the workshop) issued by “Autobot Engineers India Pvt. Ltd.” and approved by Polaris Electric.

CERTIFICATE TERM & CONDITIONS:

1. Participation certificate will be provided after your successful completion of the training program.
2. The grade certificate shall be issued only after successful completion of the assessment.
3. Candidate must score minimum 80% for the eligibility of Grade Certificate.
4. Participation certificate does not provide any proof of your assessment completion.
5. Re-Assessment shall be conducted for the candidates who scored below 80%.
6. The weightage of each module is 20 marks.
7. In case any candidate fails to achieve the passing grade in any module, shall re-appear for the online assessment in the particular module.
8. One-month grace time will be awarded to candidates falling under Rule number 5.

DETAILED GRADE SLAB:

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|--------------------|--------------------------|
| Certification | Assessment (Module Wise) |
| Total Marks = 100 | 100 Marks |
| Passing Marks = 80 | 80 Mark |

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|--------|--------|-------|-------|-------|
| Marks | 100-95 | 95-90 | 90-85 | 85-80 |
| Grades | A+ | A | B+ | B |