

## Abstract

India lithium-ion battery market is forecast to grow at a CAGR of over 29% by 2023. Anticipated growth in the market can be attributed to increasing number of solar energy projects, rising urbanization, and government schemes such as, National Electric Mobility Mission Plan (NEMMP) and 'Make in India'. Lithium Cobalt Oxide, Lithium Nickel Manganese Cobalt Oxide, Lithium Manganese Oxide, Lithium Iron Phosphate are the major types of batteries in application for consumer electronics, industrial and automotive. Moreover, an increase in mobile towers in India is driving growth in the telecom sector, which is also expected to have a positive impact on India lithium-ion battery market in the coming years, where the Indian Lithium-Ion Battery major players are Future Hi-Tech Batteries, Reliance Industries Limited, Adani Enterprise Ltd, Mahindra & Mahindra Limited, Suzuki Motor Corp, Toshiba Corp, Denso Corp, Bharat Heavy Electricals Ltd.

The expertise in assembly, design, battery chemistry, BMS and safety is becoming highly valued. The boom in EV, telecom, wind and solar has opened opportunities for automobile industry, entrepreneurs, R&D, employability and higher education.

## About the Program

KIP (Knowledge Improvement Program) on Battery Safety & BMS is 2 days crash course, specially designed based on feedbacks from training over 100+ industry professionals with the job background from R&D engineers, senior-level engineers, and mid-level engineers. This program will give in-depth knowledge and broad understanding on cell chemistries, terminologies, focus details of lithium ion batteries, lithium ion charging, discharging, cycle life, effect due to temperature, battery safety, thermal runaway, BSM, cell level testing, Lithium ion battery pack assembly and process, equipment and testing of Cells during manufacturing and its latest technologies being used globally. This program has been designed for professionals, EV enthusiasts, faculties, research associates and students from different domains (energy sector, govt. bodies, automobile, distribution, supplier, etc.), who are eager to learn about the automotive battery technology and application. This KIP program will help you to gain latest technology insights and knowledge build-up with practical demonstrations, case studies and Q&A session with the domain expert speakers from the industry.

## About the Company

Autobot Engineers India Pvt. Ltd. known as "Autobot India" is a pioneer and leading brand in electric vehicle sector which offers One Stop solutions in domain of electric vehicle, which includes training, consulting, product and development with complete testing of the product.

Autobot India offers end-to-end training & development, course development, employability enhancement solutions to the enterprises and institutes in the specific domains of electric vehicle technology, energy storage systems, BTMS, charging technology, and safety.

Autobot India courses are ISO 29990:2010 certified by American Board Accreditation Services (ABAS, USA) which is internationally recognised along with other company credentials such as Ministry of Micro, Small & Medium Enterprises (MSME); Department of Industry Policy and Promotion (DIPP) and Startup India.

## Who can Participate?

- FEV concept developing; OEM professionals or Manufacturing Entrepreneurs.
- Working professionals for battery pack development, EV assembly, EV drivetrain engineer, motor design engineer
- Engineer Trainees, Quality Engineers, Supervisors, Mfg. Head, Managers
- EV entrepreneurs, engineering students and faculties.
- Professionals from Energy Sectors, Govt. bodies (regulating authorities and policy makers).

## Pre Requisite

- Knowledge of electrical machines.
- Knowledge of motor architecture and working.
- Knowledge of electrical and electromagnetic concepts.
- Knowledge of battery chemistry and characteristics.

## Learning Outcome

- Understanding of different cell chemistries and cell, pack and system level components.
- Selection, design and test of Li-Ion battery.
- Understanding of Battery pack - material used and cell stacking.
- Understanding of working and architecture of BMS and cell balancing.
- Understanding of battery safety testing, and safety standards.
- Understanding of Battery pack assembly and cell manufacturing.

## Course Module

### Battery Fundamentals

- Battery - Types and History
- Electrochemical Potential and Cell Voltage
- Li - Ion Cells - Types and Early Development
- Design and Construction for High Rate Discharge Cell

### Li - Ion Battery Chemistry and Charging

- Charging characteristics and efficiency.
- Discharge Characteristics
- Internal Resistance
- Cycle Life and Factors Affecting Cycle Life
- Li - Ion Cell Voltages
- Effect of Temperature, State of Health, Battery Charging

### Li - Ion Battery Safety and BMS

- Safety Threats - Electrical, Thermal and Mechanical
- Thermal Runaway
- Safety Testing
- Cell Balancing
- Fuel Gauge/ Health Meter/ SOC Display
- Analog and Digital BMS
- Distributed and Centralized BMS

### Li - Ion Battery Pack Assembly

- Cell Testing and Sorting
- Cell to Cell connections - cylindrical, prismatic and pouch
- Thermal Management and Testing
- Assembly Flow chart and guidelines
- Materials Used
- Testing of pack.

### Cell Manufacturing

- Quality and Testing
- Process and Equipment Required