Lithium-Ion Battery Technologies Training Course

Professional Development Training Course Outline

Category	Renewable Energy	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Lithium-Ion Battery Technologies Training Course provides a comprehensive, industry-focused foundation in advanced energy storage, lithium-ion cell chemistry, battery materials, battery manufacturing, battery management systems (BMS), thermal management, fast charging, safety, second-life applications, and battery recycling. Lithium-ion batteries remain central to electric mobility, renewable-energy integration, portable electronics, and grid-scale energy storage, while emerging developments in silicon anodes, LFP chemistry, solid-state batteries, intelligent BMS, direct recycling, and circular battery supply chains are reshaping the industry. Recent research highlights the growing importance of fast-charging technologies, silicon-based anodes, digital monitoring, automated disassembly, and closed-loop material recovery.

The course connects battery science with practical engineering and business applications, enabling participants to understand the complete battery value chain—from raw materials and electrode design to cell manufacturing, pack integration, operation, diagnostics, reuse, and end-of-life recovery. Through practical examples and case studies covering EV batteries, LFP systems, silicon-graphite anodes, fast-charging platforms, BMS architectures, second-life storage, and advanced recycling, participants develop the knowledge required to evaluate battery performance, reliability, sustainability, and technology-selection decisions. Current industry research increasingly treats recycling as a circular-economy and systems-integration challenge, particularly as new chemistries and battery formats enter the market.

Programme Curriculum

Lithium-Ion Battery Technologies Training Course

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Course Duration

5 days

Course Objectives

1. Understand lithium-ion battery fundamentals, electrochemistry, cell architecture, and operating principles.
2. Evaluate NMC, NCA, LFP, LMFP, lithium-metal, silicon-graphite, and emerging battery chemistries.
3. Analyze cathode, anode, electrolyte, separator, binder, and current-collector technologies.
4. Understand cell manufacturing, electrode coating, calendaring, formation, aging, and quality control.
5. Examine battery pack design, module architecture, electrical interconnection, and system integration.
6. Develop knowledge of Battery Management Systems (BMS), state estimation, diagnostics, balancing, and predictive health monitoring.
7. Explore thermal management and battery safety, including thermal runaway prevention and system-level risk mitigation.
8. Analyze fast charging, high-power operation, lithium plating, degradation mechanisms, and charging optimization.
9. Evaluate silicon-anode technologies, composite electrodes, artificial SEI strategies, and commercialization challenges.
10. Examine solid-state battery technologies, interfaces, materials, sustainability, and commercialization pathways.
11. Assess second-life battery applications, performance degradation, repurposing, and stationary energy storage.
12. Compare pyrometallurgy, hydrometallurgy, direct recycling, black-mass processing, and battery circularity.
13. Apply life-cycle thinking, sustainability, digitalization, supply-chain resilience, and technology roadmapping to battery projects.

Target Audience

1. Battery engineers and energy-storage professionals
2. Electrical, electronics, mechanical, and chemical engineers
3. EV and automotive technology professionals
4. Renewable-energy and grid-storage specialists

5. Battery manufacturing and quality-control teams
6. Researchers, scientists, and technology developers
7. Sustainability, recycling, and circular-economy professionals
8. Project managers, technical consultants, entrepreneurs, and energy-sector decision-makers

Course Modules

Module 1: Lithium-Ion Battery Fundamentals & Electrochemistry

- Cell architecture
- Electrochemical principles
- Cell formats
- Performance metrics
- **Case Study:** Comparative analysis of **LFP versus NMC** for electric-vehicle applications

Module 2: Battery Materials & Next-Generation Chemistries

- Cathode technologies
- Anode technologies
- Electrolytes
- Interface engineering
- **Case Study: Silicon-graphite anodes** and strategies for managing volume expansion and cycle-life challenges.

Module 3: Cell Manufacturing & Quality Engineering

- Electrode production
- Cell assembly
- Formation and aging
- Quality control
- **Case Study:** Applying **digital manufacturing and real-time monitoring** to improve battery production quality

Module 4: Battery Pack Design, BMS & Digital Battery Intelligence

- Module and pack architecture
- BMS functions
- State estimation
- Battery balancing and predictive health monitoring
- **Case Study: AI-enabled BMS and predictive maintenance** for an EV battery pack

Module 5: Thermal Management, Fast Charging & Battery Safety

- Thermal behavior
- Thermal management
- Fast charging
- Safety engineering
- **Case Study: Extreme fast charging (XFC)** and coordinated thermal-management strategies.

Module 6: Solid-State & Emerging Battery Technologies

- Solid-state battery fundamentals:

- Oxide, sulfide, polymer and composite electrolyte platforms
- Lithium-metal anodes and high-energy-density architectures
- Commercialization
- **Case Study: Solid-state battery sustainability and ecodesign**, including standardized formats and closed-loop material flows.

Module 7: Battery Degradation, Second Life & Lifecycle Management

- Degradation mechanisms
- Diagnostic approaches
- Second-life applications
- Lifecycle optimization
- **Case Study:** Repurposing **retired EV batteries for stationary energy storage** and evaluating technical and environmental trade-offs.

Module 8: Battery Recycling, Circular Economy & Future Outlook

- Battery collection, discharge, dismantling and material separation
- Pyrometallurgy, hydrometallurgy and direct-recycling pathways
- Black mass, critical-mineral recovery and cathode regeneration
- Circular economy, recycled content, reverse logistics and sustainable battery supply chains
- **Case Study:** Comparing **direct recycling with conventional recycling routes** for recovering and regenerating valuable battery materials.

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
21 Sep 2026	25 Sep 2026	Online	$1,000
21 Sep 2026	25 Sep 2026	Physical	$1,500
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0

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