EV Energy Management Systems 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

EV Energy Management Systems Training Course provides a practical, industry-focused understanding of how electric vehicle (EV) energy management, battery management systems (BMS), smart charging, energy optimization, and vehicle-to-grid (V2G) technologies are transforming the automotive and energy sectors. As EV adoption accelerates, organizations increasingly need professionals who can optimize battery performance, charging infrastructure, energy consumption, thermal performance, and grid interaction. This course explores the complete EV energy ecosystem, from lithium-ion battery technology, state-of-charge (SOC) and state-of-health (SOH) estimation to DC fast charging, regenerative braking, AI-driven energy optimization, and real-time energy monitoring. Participants gain practical knowledge of designing, analyzing, and improving intelligent energy-management strategies for modern electric and connected vehicles.

The program combines technical theory, hands-on learning, industry case studies, system analysis, simulations, and problem-solving exercises to build job-ready capabilities. Participants examine how artificial intelligence (AI), machine learning, IoT, cloud analytics, digital twins, predictive maintenance, and smart-grid integration are shaping next-generation EV energy systems. Real-world case studies demonstrate applications across passenger EVs, commercial fleets, buses, charging networks, and renewable-energy-integrated mobility. By completing the course, learners can contribute to EV infrastructure planning, battery optimization, fleet energy management, charging strategy development, sustainability initiatives, and intelligent transportation systems, while understanding the commercial and operational challenges involved in deploying scalable EV energy solutions.

Programme Curriculum

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Introduction

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Course Duration

5 days

Course Objectives

By the end of the course, participants will be able to:

1. Understand the architecture and operating principles of EV Energy Management Systems (EMS).
2. Analyze battery energy consumption, SOC, SOH, State of Power (SOP), and battery degradation.
3. Apply Battery Management System (BMS) principles for safe and efficient battery operation.
4. Develop strategies for EV range optimization and intelligent energy consumption.
5. Evaluate AC charging, DC fast charging, smart charging, and charging-load management.
6. Understand regenerative braking and its contribution to vehicle energy efficiency.
7. Explore AI, machine learning, and predictive analytics for EV energy optimization.
8. Apply thermal management techniques to improve battery safety, performance, and lifespan.
9. Analyze Vehicle-to-Grid (V2G), Vehicle-to-Home (V2H), and Vehicle-to-Building (V2B) applications.
10. Integrate renewable energy, energy storage, and EV charging infrastructure.
11. Evaluate IoT, cloud-based monitoring, telematics, and real-time energy analytics.
12. Apply digital twin and simulation technologies to EV energy-management scenarios.
13. Design data-driven strategies for sustainable mobility, fleet electrification, carbon reduction, and smart-grid integration.

Target Audience

1. EV Engineers and automotive engineering professionals.
2. Battery and BMS Engineers working with energy-storage technologies.
3. Electrical, Electronics, and Power Systems Engineers.
4. EV Charging Infrastructure designers, operators, and project managers.
5. Fleet Managers implementing electric mobility and fleet electrification.
6. Energy and Sustainability Professionals developing low-carbon transportation strategies.

7. Automotive Software, IoT, AI, and Data Analytics Professionals.
8. Technical Managers, Consultants, Researchers, and Entrepreneurs entering the EV ecosystem.

Course Modules

Module 1: EV Energy Management Fundamentals

- EV powertrain architecture and energy-flow fundamentals.
- Energy-management objectives: efficiency, range, performance, safety, and battery life.
- Energy consumption modeling for different driving cycles and operating conditions.
- Introduction to real-time energy monitoring and control strategies.
- Case Study: Energy optimization analysis of a battery-electric passenger vehicle under urban and highway driving conditions.

Module 2: Battery Technology and Battery Management Systems

- Lithium-ion battery chemistry, cell, module, and pack architecture.
- BMS architecture, monitoring, balancing, protection, and diagnostics.
- SOC, SOH, SOP, State of Energy (SOE) estimation.
- Battery degradation, aging mechanisms, and predictive battery health analytics.
- Case Study: BMS optimization for extending the useful life of an EV battery pack.

Module 3: EV Charging and Smart Energy Management

- AC charging, DC fast charging, ultra-fast charging, and charging standards.
- Smart charging and dynamic load management.
- Charging scheduling based on tariffs, grid demand, and vehicle requirements.
- Bidirectional charging and intelligent charging-control strategies.
- Case Study: Smart charging deployment for a commercial EV fleet to reduce peak electricity demand.

Module 4: Energy Optimization and Regenerative Braking

- Energy-flow analysis across motor, inverter, battery, auxiliaries, and drivetrain.
- Regenerative braking principles and energy-recovery strategies.
- Driving behavior and its impact on EV range and energy efficiency.
- Eco-driving algorithms and model predictive control (MPC) concepts.
- Case Study: Improving city-bus energy efficiency through regenerative-braking optimization.

Module 5: EV Thermal Management and Battery Safety

- Battery thermal behavior and temperature-dependent performance.
- Air, liquid, refrigerant, and advanced thermal management systems.
- Thermal runaway prevention, detection, and mitigation.
- Fast-charging impacts on battery temperature and degradation.
- Case Study: Thermal-management strategy for an EV battery operating under high ambient temperatures and fast-charging conditions.

Module 6: AI, IoT, Data Analytics, and Digital Twins

- Artificial intelligence and machine learning for EV energy prediction.
- IoT-enabled vehicle, battery, and charging-station monitoring.
- Cloud platforms, telematics, dashboards, and real-time analytics.

- Digital twins for battery and EV energy-system simulation.
- Case Study: AI-based prediction of EV energy consumption using driving, weather, traffic, and battery data.

Module 7: V2G, Renewable Energy, and Smart Grids

- Vehicle-to-Grid (V2G) operating principles and grid-services opportunities.
- Vehicle-to-Home (V2H) and Vehicle-to-Building (V2B) applications.
- Integration of EVs with solar PV, battery storage, microgrids, and renewable energy.
- Demand response, peak shaving, frequency regulation, and distributed energy resources.
- Case Study: Solar-powered EV charging combined with V2G to support a smart commercial microgrid.

Module 8: EV Fleet Energy Management and Future Mobility

- Fleet charging optimization and electric fleet energy management.
- Route, payload, weather, traffic, and charging-data integration.
- Predictive maintenance and fleet-performance analytics.
- Sustainability, carbon reduction, total cost of ownership (TCO), and electrification planning.
- Case Study: Designing an energy-management strategy for an electric delivery fleet using route optimization, smart charging, and predictive analytics.

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
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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