



Alliance for Batteries Technology, Training and Skills

2019-2023

Electrical Engineer



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Electrical Engineer in Battery Industry

A battery electrical engineer is responsible for designing, developing, and testing electrical systems for batteries. They work with a team of engineers and scientists to create efficient and cost-effective energy storage solutions for electric vehicles, consumer electronics, and other applications. They are responsible for the electrical design of the battery system, which includes the battery cells, control and management electronics, and safety systems.

They need to have a strong understanding of electrical engineering, materials science, and manufacturing processes, as well as experience with battery management systems, safety protocols, and regulations. They also need to be familiar with simulation and modeling tools to predict the performance of the battery systems under different conditions. They need to be able to work closely with other engineers and stakeholders to ensure that the electrical design of the battery system meets the requirements of the application and is compatible with the rest of the system. They also need to be familiar with the regulations and standards related to battery electrical systems and safety. They may also be responsible for the testing and validation of the electrical systems, and for troubleshooting and resolving issues that arise during the development or production phases.

ESCO Occupations - [ESCO - Occupations - European Commission \(europa.eu\)](https://ec.europa.eu/esco/)

ID	NAME	Concept URI
2151.1	electrical engineer	http://data.europa.eu/esco/occupation/86ca306c-ab99-420a-9e2a-aa73c5c4de22

Context

Minimum EQF	4/6/7/8
Value Chain	Raw Materials and Processing Cell and Components Manufacturing Modules and Packs Battery Integration Operation, Repair, and Maintenance

	Second Life Recycling
Departments	Production and Maintenance RnD
Specialisations	Other job roles that are more specialised but based on this Electrical Engineer Facilities Projects Cell Module Electrical Engineer Electrical Engineer (BMS) Electrical Engineer/Battery Specialist Electrical Engineer (PV) Electrical Engineer, EV Battery Dev. Electrical Engineer Hybrid Vehicles Electrical Design Engineer Electrical Engineer - Firmware Manager Electrical Engineer - Motorbikes Electrical System Engineer Electrification Engineer - Electric and Hybrid Powertrain EV General - Electrical Engineer Electric Vehicle Engineer - Charging Electrical Engineer - Batteries and Chargers Electrical Design Engineer Development Engineer Electrics Electrical Engineer Electrical Wiring Engineer Electrical Subject Matter Expert CE Electrical Engineer Electrical Engineer - Critical Environments

Cross-sectoral Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Embedded Systems	K	- performs electrical engineering analyses, consulting, and expertise in the fields of electronics, embedded systems, battery systems or power generation and distribution	Expert	embedded systems
Product Design	S	- Design, develop, characterize, optimize and validate the electrical system - Design the product to meet internal and external safety regulations and standards - Develop design specifications and functional requirements - Generate new testing protocols based on new product designs	Expert	develop product design

Project Management	K	<ul style="list-style-type: none"> - Design and execute component, sub-system, and system design validation plan - Define and document system, sub-system, and component functional and performance requirements - Solve identified problems - Responsible for improvements in the quality process 	Expert	project management principles; project management
Process Improvement	S	<ul style="list-style-type: none"> - Identify areas for continuous improvement - Streamline product development and implement best practices while eliminating waste - Build internal hardware and software tools to improve quality and efficiency 	Expert	identify process improvement
Analysis Methods	K	<ul style="list-style-type: none"> - Validation, optimization and efficiency analysis - Understand and apply Failure Mode Effects Analysis (FMEA) concepts and root cause failure analysis to open-ended problems - Use the relevant quality tools/systems to analyse data and deal with non-conformances - Perform electrical engineering analyses 	Expert	
Develop/Ensure Conformity to Specifications	S	<ul style="list-style-type: none"> - Use the relevant quality tools/systems to analyse data and deal with non-conformances - Analyse validation results and compare to charging standards and norms for conformance - Organize the Firmware contributions within the team to align with the overall firmware architecture - Ensure firmware releases meet requirements 	Practitioner	ensure conformity to specifications
(Automated) Product Testing	S	<ul style="list-style-type: none"> - Design and execute component, sub-system, and system design validation plan - Perform simulations and prepare testing needed to verify and validate the electrical system design - Promote and execute quality standards, inspection processes and test methodology - Perform validation testing for the components and whole system - Experience in simulation of electrical system performance 	Expert	perform product testing
Requirements Engineering	S	<ul style="list-style-type: none"> - Use the relevant quality tools/systems to analyze data and deal with non-conformances - Study and comply with customer requirements - Interface with Shop personnel during installation and testing to ensure product compliance with design formation and delivery requirements 	Practitioner	conform with production requirements

		- Understand and gather electrical design requirements		
System Engineering/Specification	S	<ul style="list-style-type: none"> - Develop electrical schematics and other design documentation - Develop design specifications and functional requirements - Improve the basis of specifications for installation 	Expert	write specification
Product Development	S	<ul style="list-style-type: none"> - Design, develop, characterize, optimize and validate electrical system and battery distribution system - Develop electrical schematics and other design documentation - Integrate and validate new product designs - Interface with hardware design and development 	Expert	develop new products
Models/Modelling/Diagrams/Schematics	S	<ul style="list-style-type: none"> - Design, develop, characterize, optimize and validate the electrical system of High-Performance battery systems - Develop design specifications and functional requirements - Development of active programs and future concepts - Design, develop, code, test and debug systems software - Develop testing solutions on model, software, and hardware level for new mobility systems 	Expert	develop models
CAD	S	<ul style="list-style-type: none"> - Proficiency with electric design software (E3 schematic, EPLAN, AutoCAD Electrical or similar) - Skills in 3D CAD systems (Solidworks) 	Expert	use CAD software
Powertrain / Drivetrain	K	<ul style="list-style-type: none"> - Experience in electric/hybrid powertrain system development - Understanding of various electric & hybrid vehicle architectures, systems, subsystems, etc. at various voltage levels (36V/48V, 100V, 350V+, etc.) including component design, selection, & mating - Develop testing solutions on model, software, and hardware level for new mobility systems, Electric Vehicle powertrain services, or charging infrastructure - Experience in working on vehicle electrical systems 	Expert	

Sector Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Vehicle Battery Systems	K	<ul style="list-style-type: none"> - Develop and deliver content across all segments of the vehicle 12V system including but not limited to lighting, instrument, harnesses, controls and control modules. - Optimize system integration and function at the vehicle level including high and low voltage systems. 	Practitioner	vehicle electrical systems

		<ul style="list-style-type: none"> - Planning, design, validation, manufacturing, and field support of worldwide off-road electrical/electronic systems and components to lead design implementation into production 		
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Soft Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Teamwork	S	<ul style="list-style-type: none"> - Good teamwork skills required - Provide technical leadership and support - Lead or participate in teams - Exchange experience with others 	Practitioner	teamwork principles
Communication	K	<ul style="list-style-type: none"> - Communicate with stakeholders inside and outside organisation - Influence, mentor, and inspire teammates - Experience with wireless communication principles and protocols - Excellent communication skills and ability to work cross-functionally with technical and non-technical groups 	Practitioner	communication
Problem Solving/Trouble shooting	S	<ul style="list-style-type: none"> - Solve identified problems - Drive root cause analysis on process or asset failures - Understand and apply Failure Mode Effects Analysis (FMEA) concepts and root cause failure analysis to open-ended problems - Define measures for failure avoiding - Perform checks and investigation regarding various possible issues such as failures, malfunction, mechanical damages and unknown damages - Experience in system analysis, testing, troubleshooting, diagnostics 	Expert	problem solving & shoot

General Transversal Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Documentation	S	<ul style="list-style-type: none"> - Use the relevant quality tools/systems to analyse data and deal with non-conformance - Promote and execute quality standards, inspection processes and test methodology, documents and 	Expert	use technical documentation; observe documents

		reports <ul style="list-style-type: none"> - processing of drawing documentation - Develop electrical schematics and other design documentation - Define and document system, sub-system, and component functional and performance requirements 		health and safety in the workplace follow reporting procedures communicate with customers
Health and Safety Standards	K	<ul style="list-style-type: none"> - Design the product to meet internal and external safety regulations 	Expert	
Reporting	S	<ul style="list-style-type: none"> - Support system drawing creation, review, and release - Create analyses and report quality issues and root causes - Produce reports - Draw electrical diagrams 	Practitioner	
Customers/Stakeholders	S	<ul style="list-style-type: none"> - Excellent communication skills and ability to work cross-functionally with technical and non-technical groups - Communicate with stakeholders inside and outside organisation - Represent the own area of competence to internal and external customers - Customer oriented mindset 	Expert	

Academic Competence (can be taken from University programme)

Name	Type (S/K)	Description/Context	Level	ESCO
Mechanical Engineering	K	<ul style="list-style-type: none"> - Execute charging tests on software, component, system, and vehicle level - Analyse validation results and compare to charging standards and norms for conformance - Develop testing solutions on model, software, and hardware level for new mobility systems - Build internal hardware and software tools to improve quality and efficiency 	Expert	mechanical engineering
Electrical Engineering	K	<ul style="list-style-type: none"> - Perform electrical engineering analyses, consulting, and expertise in the fields of electronics, embedded systems, battery systems or power generation and distribution - Perform simulations and prepare testing needed to verify and 	Expert	electrical engineering

		validate the electrical system design - Develop electrical schematics and other design documentation		engineering principles
Engineering	K	- Design, develop, code, test and debug systems - Define high level firmware architecture for systems - Analyse and enhance efficiency - Integrate and validate new product design - Interface with hardware design and development	Expert	