albatts

Alliance for Batteries Technology, Training and Skills

2019-2023

Battery System Engineer

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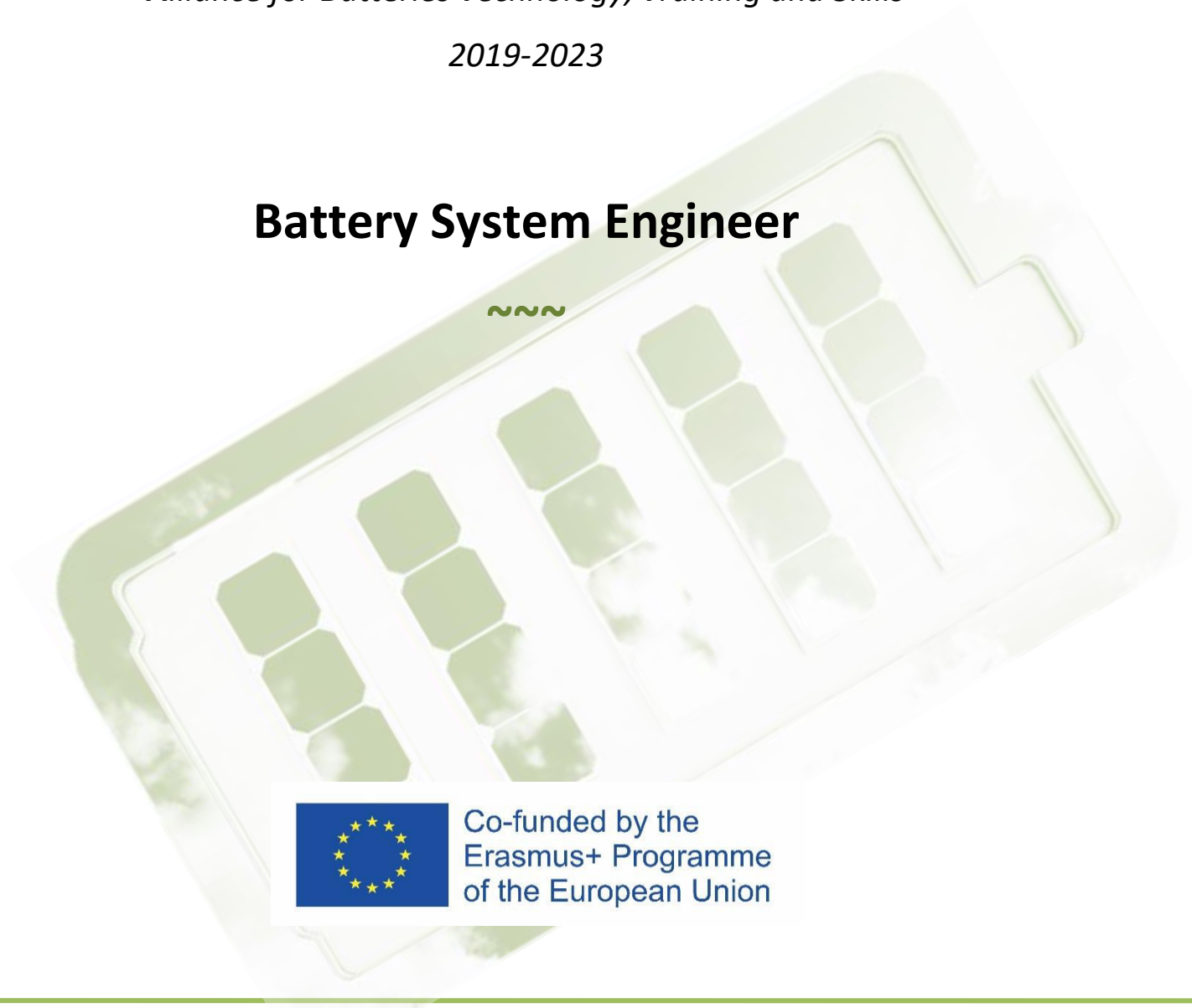

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Battery System Engineer

A battery system engineer is responsible for designing, developing, and testing battery systems for various applications. They work with a team of engineers and scientists to create efficient, safe and cost-effective energy storage solutions for electric vehicles, consumer electronics, grid storage and other applications. They are responsible for the overall performance of the battery system, which includes the battery cells, control and management electronics, thermal management 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 battery system meets the requirements of the application and is compatible with the rest of the system.

ESCO Occupations - ESCO - Occupations - European Commission (europa.eu)

ID	NAME	Concept URI
2511.5	embedded system designer	http://data.europa.eu/esco/occupation/10469d70-78a3-4650-9e29-d04de13c62c1
2511.16	ICT system integration consultant	http://data.europa.eu/esco/occupation/bd9d395a-d587-45c6-8d72-ceef226df9e1
2149.9.2	energy systems engineer	http://data.europa.eu/esco/occupation/1ff61522-8947-4c95-b589-cb0e0539a62b

Context

Minimum EQF	6/7/8
Value Chain	Cell and Components Manufacturing Modules and Packs Battery Integration

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Departments	Production and Maintenance RnD IT/Digitalisation
Specialisations	Battery System Engineer Senior Electric Distribution Systems and Charging Senior Battery Systems Engineer - Innovation Battery System Consultant Battery System Engineer PMIC Systems Engineer – Battery Gauging (base stations) Lithium-ion Cell Battery System Engineer System Engineer Battery System Engineer - Aviation System Engineer - EV Sr. System Engineer System Integration Engineer Senior System Design Engineer Senior Battery Management System Engineer Senior Battery System Engineer Battery System and Technology Engineer

Cross-sectoral Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Models/Modelling/ Diagrams/Schematics	S	- Ability to develop battery systems, including, but not limited to, battery cell technology evaluation for a given application assessing life, duty cycle and performance, design optimization for efficiency and reliability, battery safety and battery management system - Understanding of cross functional engineering, development and design principles including knowledge of electronic hardware design, sensors and customer facing software - Lead battery cell, module, system testing and modelling. Develop cell performance trade-off and limits	Expert	develop models
(Process) Control Systems	S	- Devices or a set of devices that command and manage the performance and behaviour of other equipment and systems. This includes Industrial control systems (ICS) which are used for industrial production and manufacturing.	Practitioner	process control systems

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Analyse Test Data	S	- Analyse battery electrical and thermal performance at the cell, module, and pack level - Set up test environment, support to test and validate the developed battery algorithms - Components validation plans and test methods	Expert	analyse test data
(Automated) Product Testing	S	- Supervising the testing of finished products and systems - Components validation plans and test methods - Produce test specifications/procedures and assist with setting up the tests as needed - Evaluate/report test results.	Expert	perform product testing
Embedded Systems	K	- Embedded sw engineer for battery management system (BMS) - Define the interface and control strategy of embedded software - using ARM based microcontrollers	Expert	embedded systems
SW Development	K	- Develop the software for the battery management system - Develop battery management systems and define processes for their maintenance - participate in system definition, development and validation of Li-ion Battery Gauging		software and applications development and analysis
Requirements Engineering	S	- Support design development, prototyping, validation and industrialization teams to optimize and balance requirements to develop the best overall solutions - Managing subsystems and component level design requirements - Elicitation and definition of requirements	Expert	conform with production requirements
Risk Management	K	- Support overall requirements traceability, system architecture definition, interface management, and risk management - Root cause analysis of failures to drive continual improvement	Expert	Risk Management
Project Management	K	- Project management skills and financial understanding - Execute engineering tasks defined within projects in order to meet schedule, budget and specifications - Ensure all cross functional inputs are addressed in selected design concepts and project targets in terms of cost and delivery are met - Ensure compliance to internal and external standards	Expert	project management principles; project management

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		in terms of product requirements, documentation requirements and process requirements		
General Programming Languages	K	- The techniques and principles of software development, such as analysis, algorithms, coding, testing and compiling of programming paradigms in various programming languages, such as C/C++, Java, C#. This also applies to scripting languages such as Python.	Practitioner	Computer programming
Inspect Quality of Product / Sampling	S	- Quality Assurance team member - investigation of root cause of failures to drive continual improvement - Supervising the testing of finished products and systems	Expert	inspect quality of product
Process Improvement	S	- Investigation of root cause of failures to drive continual improvement - Providing support to ongoing product and process improvement - Contribute to overall profitability related to component design and continuous improvements on new and existing products	Practitioner	identify process improvement
Analysis Methods	K	- Understanding and the ability to use different analysis methods in different processes - Produce necessary documentation especially in regards of safety, e.g. hazard analysis and FMEA - Develop and drive component, subsystem and system level validation plans, test methods, test execution and analysis - Develop and use analytical tools for verifying battery system performance - Perform simulations, analysis, and DFMEA to ensure that the system meets the needs and the battery fulfils systems requirements - Knowledge of different analysis methods e.g. failure analysis - Experience in analysis techniques	Expert	analysis methods
System Engineering/Specification	S	- Write technical requirements for the different disciplines - Understanding of system engineering of the design from concept through manufacturing	Expert	write specification
Product Development	S	- Familiar with battery development process for EV/HEV applications	Expert	develop new products

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		- Develop system, component, and sub-component including functional, performance, safety, and compliance requirements - Execute analyses of potential designs, including electrical capability, battery life, thermal, isolation/creepage and clearance, etc - Support the development of an efficient energy storage solution strategy - including batteries, controls, and associated hardware - Develop battery models for integration into firmware - Stay informed on latest battery development, pricing, research, vendors, manufacturers, pricing, and manufacturing techniques - Experience with systems modelling, simulation & validation environment (e.g. MIL, SIL & HIL) - Perform CAD modelling of the battery components		
Safety Procedures	K	- Perform Functional safety analysis, new content analysis, D-FMEA and PHA - Ensure that designs and documentation of components and systems meet specified technical customer demands, product safety, legislative requirements and internal demands	Practitioner	safety engineering
Functional Safety	K	- Experience in functional safety analysis including Safety Hazard Analysis, FMEA, REL and FTA	Expert	
System Integration	S	- Understand li-ion battery packs and their integration into larger systems - Knowledge of and hands-on experience with high voltage electric vehicle battery systems, architecture, design and integration including cell performance and selection, battery design, performance and integration - Experience in system design and architecture	Expert	define integration strategy
Validation / Verification	S	- Knowledge of systems modelling, simulation & validation environment (e.g. MIL, SIL & HIL) - Components validation plans and test methods - Systems engineering for product development, including requirement engineering, system design, analysis, and validation - Understanding customer technical requirements and expectations, and developing/driving system solutions from concept to launch	Practitioner	apply validation engineering

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		- Understanding system development process to meet the requirements of ISO 26262, ASPICE and cybersecurity		

Sector Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
BMS	K	- Develop battery management systems and defines processes for their maintenance - Define the interface and control strategy of embedded BMS software - Develop the software for the battery management system - BMS development with HW and SW design and evaluation experiences - experience in high voltage battery management system HW development with cell monitors, module level HV communication, pack level master controllers and communication interfaces for system interactions.	Expert	BMS
Lithium-ion Chemistry	K	- Understanding of battery chemistry and li-ion systems - Develop li-ion battery systems - Support the solution development for extending Li-ion battery performance and lifetime - Extensive knowledge of battery technologies	Expert	battery chemistry
Battery System	K	- Knowledge and understanding the aspects of battery systems	Expert	
Vehicle (Battery) Systems	K	- Develop and document engineering requirements for electric vehicle battery systems - Develop and use analytical tools for verifying battery system performance - Battery pack systems and subsystems research and development	Expert	vehicle electrical systems

Soft Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Teamwork	K	- Work with multiple teams on development issues - Managing subsystems and component level design requirements through collaboration with internal and outside operators	Practitioner	teamwork principles
Communication	K	- Fluent communication with different stakeholders during processes	Practitioner	communication

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		- Collaborating across teams - Excellent communication skills, both written and verbal		
Problem Solving/Trouble shooting	S	- Troubleshooting and problem-solving skills - experience in system analysis, testing, troubleshooting, diagnostics and root cause analysis - Experience with DFM and 8D - Experience in DFMEA and failure analysis - Understanding of product risk management, relevant testing standards, new content analysis, FMEA, PHA, Root cause analysis and related tools/methods	Expert	problem solving & troubleshoot

General Transversal Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Customers/Stake holders	S	- Working closely with customer technical and project personnel - Collaborate with customers to produce and manage subsystems and component level design requirements - Support design development, prototyping, validation and industrialization teams to optimize and balance requirements to develop the best overall solutions - Organizes both external and internal stakeholder requirements for new products / features / technology developments - Collaboration with customer on requirements	Expert	communicate with customers
English	K	- Working in an international environment	Practitioner	English
Documentation	S	- Technical drawings and production documentation - Support the battery-related big data pre-processing and cleaning - Perform detailed studies to inform cell selection and battery pack sizing for future projects - Ability to produce and understand technical documentation	Expert	use technical documentation; observe documents
Health and Safety Standards	K	- Support activities to ensure both a safe workplace and adoption of safe working practices	Practitioner	health and safety in the workplace
Standard/isation	S	- Battery homologation	Practitioner	adhere to standard procedures

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Academic Competence (can be taken from University programme)

Name	Type (S/K)	Description/Context	Level	ESCO
Engineering	K	- Engineering education on master level	Expert	engineering principles
Mechanical Engineering	K	- Knowledge and understanding of the principles of mechanical engineering	Expert	mechanical engineering
Electrical Engineering	K	- Knowledge and understanding of the principles of electrical engineering	Expert	electrical engineering
Computer Science / IT Management	K	- Computer Science on master level	Expert	Computer science

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