albatts

Alliance for Batteries Technology, Training and Skills

2019-2023

Embedded System and BMS Engineers

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Embedded System and BMS Engineers

An embedded systems engineer is responsible for designing, developing, and testing embedded systems, which are computer systems integrated into other devices or products. They work with a team of engineers and scientists to create efficient and cost-effective solutions for various applications such as electric vehicles, consumer electronics, industrial control systems, and other applications. They need to have a strong understanding of electrical engineering, computer science, and software engineering, as well as experience with microcontrollers, embedded operating systems, and programming languages.

A Battery Management System (BMS) engineer is responsible for designing, developing, and testing the BMS for batteries. They work with a team of engineers and scientists to create efficient and safe BMS for electric vehicles, consumer electronics, grid storage, and other applications. They are responsible for the control and monitoring of the battery's state of charge, state of health, and other performance parameters, as well as for the implementation of safety measures and protection of the battery against abuse and malfunction. They need to have a strong understanding of electrical engineering, control systems, and computer science, 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 BMS under different conditions.

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
2512.4	software developer	http://data.europa.eu/esco/occupation/f2b15a0e-e65a-438a-affb-29b9d50b77d1
2151.1	electrical engineer	http://data.europa.eu/esco/occupation/86ca306c-ab99-420a-9e2a-aa73c5c4de22
2514.2.1	embedded systems software developer	http://data.europa.eu/esco/occupation/57af9090-55b4-4911-b2d0-86db01c00b02

Context

Minimum EQF	6/7/8
Value Chain	Modules & Pack Battery Integration
Departments	Production and Maintenance Quality RnD IT/Digitalisation
Specialisations	Other job roles that are more specialised but based on this Battery Management System (BMS) Engineer Battery Management System QA Engineer Electrical Engineer (BMS) Software/Modeling Engineer Lead Battery Management System (BMS) Engineer (maintenance) Embedded Software Engineer Diagnostic Engineer - BMS Function System Design Engineer - BMS Group Manager - BMS Embedded SW Developer for BMS HW Developer for BMS Requirements and System Engineer for BMS Battery Management System Lead Senior Battery Management System Engineer Application Engineer – BMS

Cross-sectoral Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Models/Modelling/ Diagrams /Schematics	S	- Develop models of batteries under extreme operating conditions based on electrochemistry knowledge and test data - Develop robust battery models to predict cell behavior including but not necessarily limited to rate performance, life degradation, calendar aging, electrochemical and thermal response, and safety related behavior - Develop advanced deep learning models and tools for data analysis and optimization	Expert	develop models

		- Develop advanced performance, lifetime, and algorithm models			
		- Experience in control engineering and model-based methods			
General Programming Languages	K	- Knowledge of the programming languages (C, C++ etc.) - Good knowledge of modern SW development tools, e.g. Git, Jira, Enterprise Architect	Expert	computer programming
Analyse Test Data	S	- Use a variety of cell and battery pack models, fleet data, and laboratory test data to create feedback control and estimation algorithms for high voltage battery packs. - Develop models of batteries under extreme operating conditions based on electrochemistry knowledge and test data	Expert	analyse test data
(Automated) Product Testing	S	- Formulate and execute designs of experiments to acquire sufficient data to train, validate, and test the battery models - Create and integrate models, define algorithms, write testing code, and evaluate the performance of algorithms throughout the life of the product - Ensure BMS system quality and reliability	Expert	perform product testing
Embedded Systems	K	- Define the interface and control strategy of embedded BMS software - design, develop, and validate Battery Management System software - Define the interface and control strategy of embedded BMS software - Experience with software such as MATLAB and Simuling	Expert	embedded systems
C/C++	K	- Knowledge and understanding of the programming languages (C, C++ etc.)	Expert	C/C++
Requirements Engineering	S	- Experience in the field of requirements engineering - Implementation of the initial commissioning and verification of the developed battery management systems - Adaptation of the existing hardware architecture to new requirements and integration of new modules - Analysis of customer requirements - Set requirements, propose, investigate, and agree on solutions, implement and follow up the solutions - Develop requirements - Understand and develop high-level system requirements and system architecture - Define the BMS SW/HW requirements	Expert	conform with production requirements

Product Development	S	- Functional design and the function development of battery management system platform (BMS) - Participation in development processes	Expert	develop new products
(Process) Control Systems	S	- Experience in control system and function development in battery management system - 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.	Expert	process control systems
SW Development / Engineering	K	- Experience in Battery Management System, software development and diagnostic systems - Experience in Embedded system design	Expert	software and applications development and analysis
Hardware	K	- Experience from Battery Management System different functions both hardware and Software - Adaptation of the existing hardware architecture to new requirements and integration of new modules - Knowledge of battery management system hardware design, development, and testing	Expert	design hardware

Sector Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Lithium-ion Chemistry	K	- Knowledge of the operation and behaviour of lithium-ion batteries	Awareness	battery chemistry
BMS	K	- Design, develop, and validate Battery Management System software - Develop embedded software for BMS applications - Functional design and development of battery management system platform (BMS). - Develop BMS functional roadmap	Expert	
Battery System	K	- Creation of specifications and functional specifications for battery systems - Developing battery systems	Expert	

Soft Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Teamwork	K	- Work in specialised teams to deliver optimal results - Work with cross-functional teams to develop, implement,	Expert	teamwork principles

Communication	K	- Communicate with customers to identify document BMS system requirements	Practitioner	communication

General Transversal Competence

Name	Type (S/K)	Description/Context	Level	ESCO
English	K	- Work in an international and multicultural environment - Good verbal and written English	Practitioner	English
Documentation	S	- Produce necessary documentation especially in regards of safety, e.g. hazard analysis and FMEA - Develop electrical schematics and other design documentation - Creation and maintenance of the documentation - Development-accompanying documentation and specification of verification plans	Expert	use technical documentation; observe documents
Analytical Skills	S	- Possess analytical and cross-functional thinking skills - Analysis of requirements	Practitioner	think analytically

Academic Competence (can be taken from University programme)

Name	Type (S/K)	Description/Context	Level	ESCO
Electrical Engineering	K	- A degree in Electrical Engineering	Expert	electrical engineering
Computer Science	K	- A degree in Computer Science	Expert	Computer science