



Alliance for Batteries Technology, Training and Skills

2019-2023

Software Developers



Co-funded by the
Erasmus+ Programme
of the European Union



Software developers

A battery software developer is responsible for designing, developing, and maintaining software systems for batteries and battery management systems. They work with a team of engineers and scientists to create efficient and cost-effective solutions for electric vehicles, consumer electronics, grid storage and other applications. They are responsible for the software design, implementation, and maintenance of the battery management systems (BMS), which includes 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.

ESCO Occupations - [ESCO - Occupations - European Commission \(europa.eu\)](http://europa.eu)

ID	NAME	Concept URI
2514.2.1	embedded systems software developer	http://data.europa.eu/esco/occupation/57af9090-55b4-4911-b2d0-86db01c00b02
2511.5	embedded system designer	http://data.europa.eu/esco/occupation/10469d70-78a3-4650-9e29-d04de13c62c1

Context

Minimum EQF	6/7
Value Chain	Raw Materials and Processing Cells and Components Manufacturing Packs and Modules Battery Integration Operation, Repair, and Maintenance Second Life Recycling
Departments	IT/Digitalisation
Specialisations	Battery Algorithms Engineer Automotive Software Developer Software Engineering Manager SW Engineer Tech Lead SW QA Engineer

<p>Battery Monitoring System SW Engineer</p> <p>EV General - Software Developers</p> <p>SW Component Owner</p> <p>SW Developer - Applications</p> <p>Software Engineer</p> <p>Lead Software Configuration Engineer</p> <p>Senior Battery Software Architect</p>

Cross-sectoral Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Models/Modelling/Diagrams/Schematics	S	<ul style="list-style-type: none"> - 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 - Develop advanced performance, lifetime, and algorithm models 	Expert	develop models
General Programming Languages	K	<ul style="list-style-type: none"> - Knowledge of the programming languages C and C++ - Knowledge of Python and other scripting language - knowledge of database systems (PostgreSQL, NoSQL (MongoDB)) 	Expert	computer programming
(Automated) Product Testing	S	<ul style="list-style-type: none"> - Formulate and execute designs of experiments to acquire sufficient data to train, validate, and test products and models - Create and integrate models, define algorithms, write testing code, and evaluate the performance of algorithms throughout the life of the product 	Expert	perform product testing
Embedded Systems	K	<ul style="list-style-type: none"> - Knowledgeable in embedded systems - Develop embedded software for BMS applications 	Expert	embedded systems
SW Development	K	<ul style="list-style-type: none"> - Drive the definition and implementation of software QA standards - Software development skills - Develop Realtime software for electric machine controls - Testing of software systems 	Expert	software and applications development and analysis

		<ul style="list-style-type: none"> - Driving the definition and implementation of software QA standards - Identify and propose areas for improvement in the BMS software or hardware - Lead software pre study and software documentation updates - Defining the SW verification plan - Software and hardware knowledge of PLC, HMI, Network Infrastructure, IED programming and logic control concept - Design and development of control algorithms and support software 		
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Sector Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
(Battery SoC, SoH) Algorithms	K	<ul style="list-style-type: none"> - Work on battery estimation algorithms regarding SOC, SOH, impedance, and performance limitation under given operating conditions - Develop advanced performance, lifetime, and algorithm models - create feedback control and estimation algorithms for high voltage battery packs - Create and integrate models, define algorithms, write testing code, and evaluate the performance of algorithms throughout the life of the product 	Expert	algorithms

Soft Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Teamwork	K	<ul style="list-style-type: none"> - Work in specialised teams to deliver optimal results - Work with cross-functional teams to develop, implement, test, and maintain models - Work in an integrated, interdisciplinary product team to examine, discuss, and develop solutions to difficult/complex issues with both internal and external stakeholders (customers, suppliers, internal management, etc.) 	Expert	teamwork principles
Problem Solving/Troubleshooting	S	<ul style="list-style-type: none"> - Ability to autonomously solve problems - Identify, troubleshoot, and resolve issues e.g. failing MIL/HIL test results 	Expert	problem solving & troubleshoot

General Transversal Competence

Name	Type (S/K)	Description/Context	Level	ESCO
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Academic Competence (can be taken from University programme)

Name	Type (S/K)	Description/Context	Level	ESCO
Computer Science / IT	K	<ul style="list-style-type: none"> - Knowledge of Python and other scripting language - Knowledge of Django, Rails, Node or similar web framework - Knowledge of RESTful web services, JSON - Knowledge of database systems such as PostgreSQL, NoSQL (MongoDB) - Knowledge of Payment systems - Drive the definition and implementation of software QA standards - Knowledge of QA automation processes and tools - Software development skills with the ability to autonomously solve problems - C/C++ skills, as well as the ability to: design programs and systems based on defined requirements; prepare program specifications; code, test, document, and debug software; interpret technical information relating to software development; and communicate effectively 	Expert	computer science