



*Alliance for Batteries Technology, Training and Skills*

*2019-2023*

## **Simulation Engineer**



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## Simulation Engineer

A battery simulation engineer is responsible for using mathematical models and simulation tools to predict the performance of batteries and battery systems under different conditions. They work with a team of engineers and scientists to create accurate and reliable simulations of the battery systems, which can be used to analyze and optimize the design, performance and safety of the batteries. They are responsible for developing and maintaining the simulation models, performing simulations and analyzing the results, and providing recommendations for design changes and improvements.

### ESCO Occupations - [ESCO - Occupations - European Commission \(europa.eu\)](http://data.europa.eu/esco/occupation/fbceeac6-798b-4307-a825-626707a753ad)

ID	NAME	Concept URI
2149.2.1	Calculation engineer	<a href="http://data.europa.eu/esco/occupation/fbceeac6-798b-4307-a825-626707a753ad">http://data.europa.eu/esco/occupation/fbceeac6-798b-4307-a825-626707a753ad</a>

### Context

<b>Minimum EQF</b>	6/7/8
<b>Value Chain</b>	Cell and Components Manufacturing Modules and Packs Battery Integration
<b>Departments</b>	Production Maintenance Quality RnD
<b>Specialisations</b>	Other job roles that are more specialised but based on this Cell Simulation Engineer Cell Module Simulation Engineer Thermal Hybrid Battery Simulation Masterand Machine Learning Engineer in Simulation within Autonomous Systems Battery Cell Simulation Engineer Battery Charging Simulation Expert Thermal Simulation Engineer Performance Simulation Engineer - Powertrain Controls Simulation Engineer

## Cross-sectoral Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Models/Modelling/ Diagrams/Schematics	S	<ul style="list-style-type: none"> <li>- Use a variety of cell and battery pack models, fleet data, and laboratory test data to create feedback control and estimation algorithms</li> <li>- Create physics-based modelling of cell and pack elements</li> <li>- Create and integrate models</li> <li>- Develop models of battery state of charge and health</li> <li>- 3D-modelling</li> <li>- Support testing, prototype build, and launch activities</li> </ul>	Expert	develop models
(Automated) Product Testing	S	<ul style="list-style-type: none"> <li>- Design experiments to extract parameters required for modelling and to validate models</li> <li>- Support testing, prototype build, and launch activities</li> <li>- Use cell and battery pack models, fleet data, and laboratory test data to create feedback control and estimation algorithms</li> <li>- Create and integrate models, define algorithms, write testing code, and evaluate the performance of algorithms throughout the life of the product</li> </ul>	Expert	perform product testing
(Battery SoC, SoH) Algorithms	K	<ul style="list-style-type: none"> <li>- SOC/SOH/SOE/SOP algorithms development</li> <li>- Understand and apply new methods regarding calculation models, algorithms, simulation, and calculation software</li> </ul>	Expert	algorithms
General Programming Languages	K	<ul style="list-style-type: none"> <li>- Good programming skills C, C++, Simulink, Stateflow</li> <li>- Matlab and Python for process automation and optimization</li> <li>- Capable of developing scripts in Matlab or Python to automate common tasks</li> </ul>	Expert	computer programming
Python	K	<ul style="list-style-type: none"> <li>- Matlab and Python for process automation and optimization</li> <li>- Capable of developing scripts in Matlab or Python to automate common tasks</li> </ul>	Expert	Python (computer programming)
Data Analysis/Science	K	<ul style="list-style-type: none"> <li>- Implement, refine, and customize diagnostic and analytical methods for characterization of cells, batteries</li> <li>- Ability to implement and understand test and simulation data analysis</li> </ul>	Expert	gather data; inspect data; process data

Simulation Methods	S	<ul style="list-style-type: none"> <li>- Contribute to building up ESS &amp; Cell simulation area</li> <li>- knowledge from leading studies or projects related to Battery Cell/Battery Simulations and design</li> <li>- Ability to use data science, machine learning, deep learning and reinforcement learning methods to extract scenarios from data, generate scenarios on maps, search edge cases, cluster scenario groups, data validation and perception performance validation, etc</li> <li>- Experience with physical modelling and/or simulation of electrical, mechanical, and hydraulic systems</li> </ul>	Expert	run simulations
Validation / Verification	S	<ul style="list-style-type: none"> <li>- Knowledge of testing and validation of components and systems</li> <li>- Use data science, machine learning, deep learning and reinforcement learning methods to extract scenarios from data, generate scenarios on maps, search edge cases, cluster scenario groups, data validation and perception performance validation, etc</li> </ul>	Expert	apply validation engineering
Diagnostics (Performance Prediction/Validation)	K	<ul style="list-style-type: none"> <li>- Experience with embedded diagnostics</li> <li>- Use data science, machine learning, deep learning and reinforcement learning methods to extract scenarios from data, generate scenarios on maps, search edge cases, cluster scenario groups, data validation and perception performance validation, etc</li> </ul>	Practitioner	performance diagnosis

### Sector Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
(Battery SoC, SoH) Algorithms	K	<ul style="list-style-type: none"> <li>- SOC/SOH/SOE/SOP algorithms development</li> <li>- Understand and apply new methods regarding calculation models, algorithms, simulation, and calculation software</li> </ul>	Expert	algorithms

### Soft Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Problem Solving/Troubleshooting	S	<ul style="list-style-type: none"> <li>- Analytical and problem-solving skills</li> </ul>	Practitioner	problem solving & troubleshooting

Teamwork	K	- Interaction with cross-functional teams to understand and work around package requirements and limitations, ergonomics, manufacturability etc. - Ability to work in teams	Practitioner	teamwork principles
Communication	K	- Good communication skills and ability to work independently & contribute as a good team player	Practitioner	communication

### 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
Mechanical Engineering	K	- A degree in Mechanical Engineering	Expert	mechanical engineering
Computer Science / IT Management	K	- Computer Science on master level	Expert	Computer science
Physics	K	- Physics on master level	Expert	Physics