



Alliance for Batteries Technology, Training and Skills

2019-2023

Battery Thermal System Engineer



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Erasmus+ Programme
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Battery Thermal System Engineer

A battery thermal system engineer is responsible for designing, developing, and testing thermal management systems for batteries. They work with a team of engineers and scientists to create efficient and safe thermal management solutions for electric vehicles, consumer electronics and other applications. They are responsible for ensuring the safe and optimal temperature range for the battery cells to function properly and preventing thermal runaway.

They need to have a strong understanding of thermal science, thermodynamics, and heat transfer, as well as experience with thermal management systems, safety protocols and regulations. They also need to be familiar with simulation and modeling tools to predict the thermal 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 thermal management 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 thermal management and safety.

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

| ID | NAME | Concept URI |
|----------|--------------------------|---|
| 2511.5 | embedded system designer | http://data.europa.eu/esco/occupation/10469d70-78a3-4650-9e29-d04de13c62c1 |
| 2149.2.4 | design engineer | http://data.europa.eu/esco/occupation/6fc8f605-98b9-4218-b5e2-91c4c9c55c4d |

Context

| | |
|--------------------|--|
| Minimum EQF | 5/6/7/8 |
| Value Chain | Cells and Components Manufacturing Modules and Packs Battery Integration |
| Departments | Quality RnD IT/Digitalisation |

Specialisations

Other job roles that are more specialised but based on this

- Battery Algorithms Engineer
- Thermal Hybrid Battery Simulation Masterand
- Design Engineer - Thermal Management System
- Thermal Design Engineer
- Thermal System Engineer
- Principal Thermal Architect
- Thermal 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"> - Set up the battery model (physical and electrochemical) to analyse the internal status of battery, calculate the exclusive charging profiles of battery based on the specific aging degree of battery to prolong the life of battery - Create physics-based modeling of cell and pack elements - Develop models of battery state of charge and health | Expert | develop models |
| Analyse Test Data | S | <ul style="list-style-type: none"> - Set up test environment, support to test and validate the developed battery algorithms | Expert | analyse test data |
| (Automated) Product Testing | S | <ul style="list-style-type: none"> - Perform simulations and prepare testing needed to verify and validate the system design | Expert | perform product testing |
| General Programming Languages | K | <ul style="list-style-type: none"> - Python scripting - Working with MATLAB | Practitioner | Computer programming |
| Machine Learning | S | <ul style="list-style-type: none"> - Experience with machine learning | Practitioner | Utilise machine learning |
| Data Analysis/ Science | K | <ul style="list-style-type: none"> - Use a variety of cell and battery pack models, fleet data, and laboratory test data to create state-of-the-art feedback control and estimation algorithms for high voltage battery packs. - Understand the principles of data science | Practitioner | gather data; inspect data; process data |
| Simulation Methods | S | <ul style="list-style-type: none"> - Selection of a suitable simulation method depending on the potential cause - It is meritorious if you have experience within measurements methods and heat transfer simulations. | Practitioner | Run simulations |
| Validation/ Verification | S | <ul style="list-style-type: none"> - Virtually verify components / systems - Knowledge of testing and validation of components and systems | Practitioner | apply validation engineering |
| Thermal Management | S | <ul style="list-style-type: none"> - write technical report and provide results of CFD & Thermal Analysis for input in Technical requirement | Expert | Design thermal equipment |

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|-----------|--|---|--|--|
| / Systems | | <ul style="list-style-type: none"> - Device a thermal runaway detection strategy for early warning - different thermal runaway detection mechanism (voltage, current, temperature, pressure, gas, swelling, derivatives, combination etc.) - responsible for the thermal management systems - Deep knowledge of heat transfer and thermodynamics, thermal management, system verifications. - Experience of cooling systems development for battery electric vehicles. | | |
|-----------|--|---|--|--|

Sector Specific Competence

| Name | Type (S/K) | Description/Context | Level | ESCO |
|-------------------------------|------------|---|--------------|-------------------|
| Cell Design | K | <ul style="list-style-type: none"> - experience within Lithium Ion-Batteries, Energy Storage System - Use a variety of cell and battery pack models - Work on projects from cell capacity, impedance, energy, and degradation estimation to diagnostics of sensors, cells and battery pack components. - Create physics-based modeling of cell and pack elements. | Practitioner | Industrial design |
| (Battery SoC, SoH) Algorithms | K | <ul style="list-style-type: none"> - Create and integrate models, define algorithms, write testing code, and evaluate the performance of algorithms throughout the life of the product. - | Practitioner | algorithms |

Soft Competence

| Name | Type (S/K) | Description/Context | Level | ESCO |
|---------------|------------|--|--------------|---------------------|
| Teamwork | K | <ul style="list-style-type: none"> - Interact with cross-functional teams to understand and work around package requirements and limitations, ergonomics, manufacturability - Ability to work as part of a team of experts | Practitioner | teamwork principles |
| Communication | K | <ul style="list-style-type: none"> - Good and assertive communication skills | Practitioner | communication |

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|----------------------------------|---|---|--------|--------------------------------|
| | | - Ability to work as part of a global team of experts | | problem solving & troubleshoot |
| Problem Solving/Trouble shooting | S | - Analytical and decisive, problem-solving mindset | Expert | |

General Transversal Competence

| Name | Type (S/K) | Description/Context | Level | ESCO |
|------|------------|---------------------|-------|------|
| | | - | | |

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 |