MJ2522 Thermal management of Battery systems 6.0 credits

Termisk hantering av batterisystem

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

The official course syllabus is valid from the autumn semester 2024 in accordance with a decision from the Faculty board of the ITM school: M-2024-0018. Date of decision: 2024-06-13.

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

Basic knowledge in heat transfer and Thermodynamics

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After passing the course, the student should be able to:

1. Analyse different types of batteries with regard to chemistry, thermal handling and safety, both descriptively and comparative.
2. Explain why batteries generate heat, basic charge/discharge models, estimates of heat generation and related experimental methods at cell level.
3. Describe different types of cooling systems in battery systems (air, liquid and immersion cooling) and be able to compare them with one another.
4. Model thermal handling in battery systems.
5. Evaluate different simulation methods and tools and their specific applications.
6. Design and dimension thermal handling and safety system for batteries.
7. Verify thermal handling and safety in batteries through different experimental methods.

Course contents

The course content includes:

- Introduction, battery chemistry, battery types
- Thermal aspects on battery cells
- Overview of battery systems (including a short overview of battery electronics), their applications and related thermal handling requirements
- Cooling systems for battery modules
- Thermal simulations: Cell/Systems/Pack
- Battery safety
- Cooling system design for battery packs – complete system design
- System qualification and validation

Examination

- PRO1 - Project, 3.0 credits, grading scale: P, F
- TEN1 - Written exam, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.