Short Advanced Studies (SAS)[1]

Modern Battery Systems

Modern battery systems are experiencing rapid progress in terms of power density, cost efficiency, and market growth. They are indispensable in energy storage and are opening up new fields of application in sustainable energy technologies.

In three days, you will gain an overview of current battery technologies with a focus on lithium-ion batteries. The current status, future prospects, and safety aspects will be examined in depth. You will learn how to evaluate systems from a technical and economic perspective and make informed decisions for your projects and business models.

[1]Short Advanced Studies (SAS) are short qualifying training courses designed for a specialist audience seeking to face new challenges in direct dialogue with experts (1-9 ECTS).

Berner
Fachhochschule

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1 Portrait

The rapid progress in battery technology is a key enabler of the transition away from fossil fuels. At the same time, improvements in energy density, power capability, and cost efficiency are opening entirely new fields of application for energy storage systems. In such a dynamic environment, it is challenging for companies to keep pace with technological developments and remain informed about the latest advances. As a result, there is a risk that new business ideas or projects are based on outdated knowledge about battery technologies. This course addresses this gap in a targeted and time-efficient manner. Participants will gain an overview of the current state of the art in battery systems, as well as insights into expected future developments, enabling them to make practical and well-informed decisions for implementation.

2 Career opportunities

With the SAS Modern Battery Systems, participants deepen their knowledge of battery technologies and gain a solid understanding of the current technological landscape. Participants acquire the skills required to assess and select appropriate battery technologies for specific applications, evaluate their technical and economic implications and optimize their use within their organization.

3 Target audience

This program is suitable to all individuals from companies or public authorities who need to explore the possibilities offered by modern battery systems:

- R&D Engineers, Production Engineers
- Project Manager
- Research staff in public or private sector
- Energy consulting staff
- Business Development Manager
- Product Manager
- Managing Directors

4 Education Goals

Participants will:

- understand the fundamentals, areas of application, and limitations of various battery technologies
- identify and evaluate opportunities arising from the use of modern batteries of various types
- be familiar with the causes of battery aging and strategies for preventing it
- be aware of safety requirements when using batteries
- recognize potential applications for modern batteries in their business/administrative environment
- understand the sustainability dimension

5 Entrance Requirements

Existing experience in evaluating battery technologies for new applications and/or a specific issue in the professional environment are helpful but not mandatory prerequisites.

6 Factsheet

Short Advanced Studies (SAS)	Modern Battery Systems
Degree/Certificate	Short Advanced Studies Modern Battery Systems
Duration	3 days
Schedule	Refer website
Application deadline	1 month before the start of the course
ECTS credits	2 ECTS credits
Costs	CHF 1'800
Teaching language	English
Location	Biel, Aarbergstrasse 46

7 Content + Structure

7.1 Day 1: Fundamentals

- Electrochemical energy storage and working principle of Li-ion batteries
- Cell chemistry (NMC, LFP, LTO, Na-ion), cell format types
- Manufacturing of lithium-ion batteries
- Battery properties and performance
- System architecture

7.2 Day 2: Technical Deep Dive into Li-ion and Demonstration

- Battery Management Systems (BMS)
- Safety aspects
- Estimation of Battery state functions
- Lifetime and aging mechanisms
  - Cycling aging and calendar aging
  - Capacity loss (State of Health – SoH)
  - Increase of internal resistance (State of Resistance – SoR)
- Laboratory demonstration with cells and modules

7.3 Day 3: Market, Applications and Sustainability

- Market overview
  - Growth forecasts
  - Raw materials and supply chains
  - Regulations and battery legislation
  - Next Battery generations
- From cell to module to application
  - Cost analysis and battery pack sensitivity
  - Manufacturers in the EU and Switzerland (cells and systems: Leclanché, Dencell, etc.)
  - Evaluation of application opportunities
- System sizing: which battery for which application
  - Grid-supportive operation (PRL, SRL, arbitrage)
  - Peak shaving, self-consumption, backup power and energy autonomy

  - Vehicle to X
- Circular economy and recycling
  - Second life, Recycling, CircuBat Project

8 Proof of proficiency

Within two weeks of completing the course, participants must submit a case study demonstrating how they have applied what they have learned in their professional or private life (1-3 A4 pages). This case study will be used to assess whether the course has been passed or failed.

Students who do not wish to provide proof of competence will receive a course certificate.

9 Lecturer

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10 Organisation

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