What is a Battery Management System?

According to Synopsys

Battery Management System(BMS) is a tech dedicated to the **supervision** of a **battery pack**, which is an assembly of battery cells, electrically organized in a row X column matrix configuration to **enable delivery** of **targeted range** of **voltage and current** for a **duration of time** against expected load scenarios.

The Oversight that a BMS provides usually includes: 1. Monitoring the battery pack 2. Provide protection to battery pack 3. Estimating the battery pack's operational state 4. Continually optimizing performance of battery pack 5. Reporting Operational Status to external devices

Lithium-Ion rechargeable cells have the highest energy density and the standard choice for battery packs for many consumer products

While they perform superbly, can wreak havoc, if operated outside of a, generally tight **safe operating area(SOA)** with outcomes ranging from **Compromising the battery performance** to outright **dangerous consequences**.

BMS certainly has a challenging job description, and it's overall complexity and oversight outreach may span many disciplines such as electrical, digita, control, thermal and hydraulic

How do battery management systems work?

Battery management systems **do not** have a **fixed or unique set of criteria** that must be adopted. The technology design scope and implemented features generally correlate with:

The **costs, complexity, and size of the battery pack Application of the battery and any safety, lifespan, and warranty concerns**

Certification requirements from **various government regulations** where **costs** and **penalties** are paramount if inadequate functional safety measures are in place

There are many BMS design features, with **battery pack protection management** and **capacity management** being two essential features.

Battery pack protection management has two key arenas: **electrical protection**, which implies **not allowing the battery to be damaged via usage outside its SOA**, and **thermal protection**, which **involves passive and/or active temperature control to maintain or bring the pack into its SOA**