# Advanced Battery Management for Transportation Electrification: Challenges and Approaches

## SPEAKER



### Huazhen Fang

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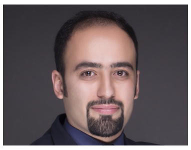

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## ABSTRACT


Lithium-ion batteries (LiBs) serve as a cornerstone technology for advancing transportation electrification, powering electric vehicles, eVTOLs, and other mobility solutions. They offer exceptional energy density, efficiency, and lifespan, making them indispensable in meeting sustainability goals. However, their widespread adoption faces critical challenges, including performance degradation, thermal management, and safety risks. These pressing issues have spurred intense research and development efforts to harness the full potential of LiBs through advanced battery management.

This short course provides a comprehensive exploration of cutting-edge developments in battery management systems (BMS), equipping participants with both foundational knowledge and insights into emerging innovations. The curriculum encompasses three core areas: 1. Battery Modeling: Explore the convergence of electrochemical principles, equivalent circuit models, and machine learning techniques to create accurate and efficient models for diverse applications. 2. State Estimation, Fault Detection, and Control: Learn about model-based methods to monitor critical battery states (e.g., state of charge and state of health), detect faults, and optimize performance through advanced control strategies. 3. Large-Scale Battery System Design and Power Management: Delve into the challenges and solutions for designing safe, robust, and efficient systems that integrate battery packs with power electronics for large-scale applications.

Participants will gain an in-depth understanding of the latest methodologies and tools to enhance battery performance, improve safety, and enable seamless integration into advanced transportation systems. Whether you are an academic researcher, industry professional, or student, this course offers valuable perspectives on the future of battery management. By the end, attendees will be well-prepared to contribute to advancing electrification technologies and shaping the future of sustainable transportation.


## About The Speaker:

**Huazhen Fang:**

Huazhen Fang is an Associate Professor of Mechanical Engineering at the University of Kansas. He received his Ph.D. from the University of California, San Diego in 2014, M.Sc. from the University of Saskatchewan, Canada in 2009, and B.Eng from Northwestern Polytechnic University, China in 2006. His research interests lie in advanced battery management. Additionally, he studies autonomy and control of complex spatio-temporal systems for aerospace applications. His work has been sponsored by NSF, DOE, ARL, among others. He received the NSF Faculty Early Career Award in 2019 and the University Scholarly Achievement Award at the University of Kansas in 2024. He currently serves as an Associate Editor for IEEE Transactions on Industrial Electronics and IEEE Control Systems Letters, among others.

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