



## RCETEEAC08– BATTERY MANAGEMENT SYSTEM

### Course outcomes:

The students will be able to:

- List the major functions provided by a battery-management system and state their purpose
- Match battery terminology to a list of definitions
- Identify the major components of a lithium-ion cell and their purpose
- Understand how a battery-management system “measures” current, temperature, and isolation, and how it controls contactors
- Compute stored energy in a battery pack
- List the manufacturing steps of different types of lithium-ion cells and possible failure modes
- State the purpose for each component in an equivalent-circuit model

### Syllabus:

**UNIT 1** Battery Boot Camp - How lithium-ion cells works - BMS sensing and high-voltage control - BMS design requirements - How are cells made? How can they fail?

**UNIT II** Defining an equivalent-circuit model of a Li-ion cell - Identifying parameters of static model - Identifying parameters of dynamic model - Simulating battery packs in different configurations - Co-simulating battery and electric-vehicle load

**UNIT III** How does lithium-ion cell health degrade? - Total-least-squares battery-cell capacity estimates - How to write code for the different total-capacity estimators - Introduction to Modeling and Control of Single-Phase Rectifiers and Inverters, Introduction to Grid-Tied Power Electronics, Low Harmonic Rectifiers, CCM and DCM Operation of the Boost Low-Harmonic Rectifier - Control of the PFC Boost Rectifier, Input Voltage Feedforward Compensation, Loss-Free Resistor Model.