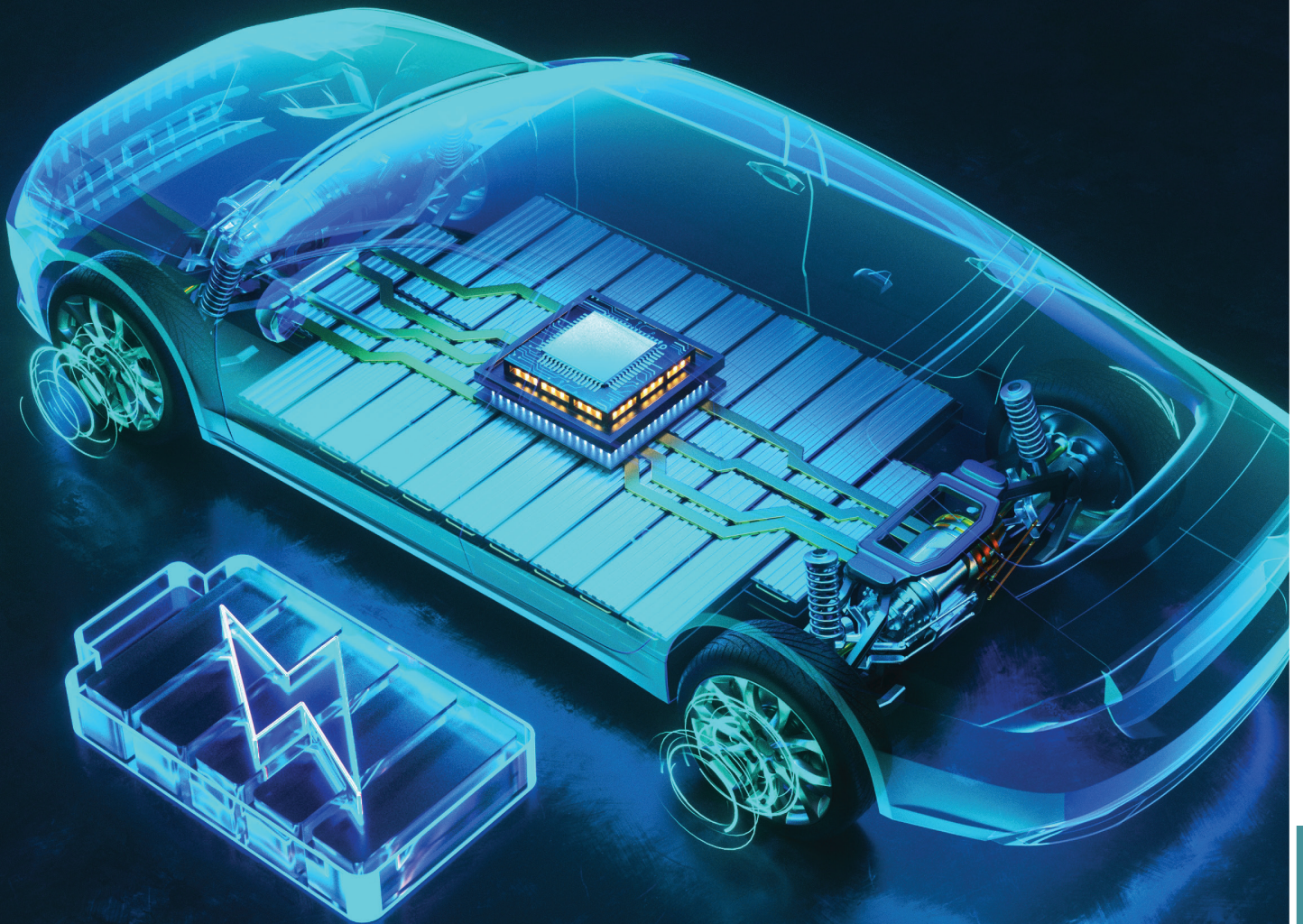




Centre for Outreach and Digital Education
Indian Institute of Technology Madras



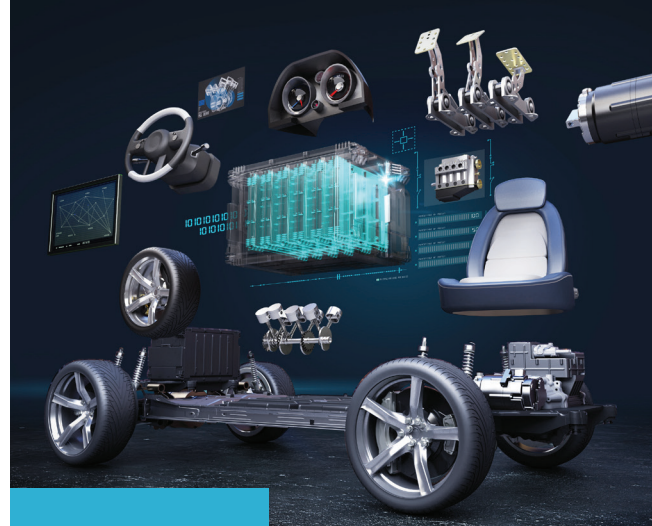
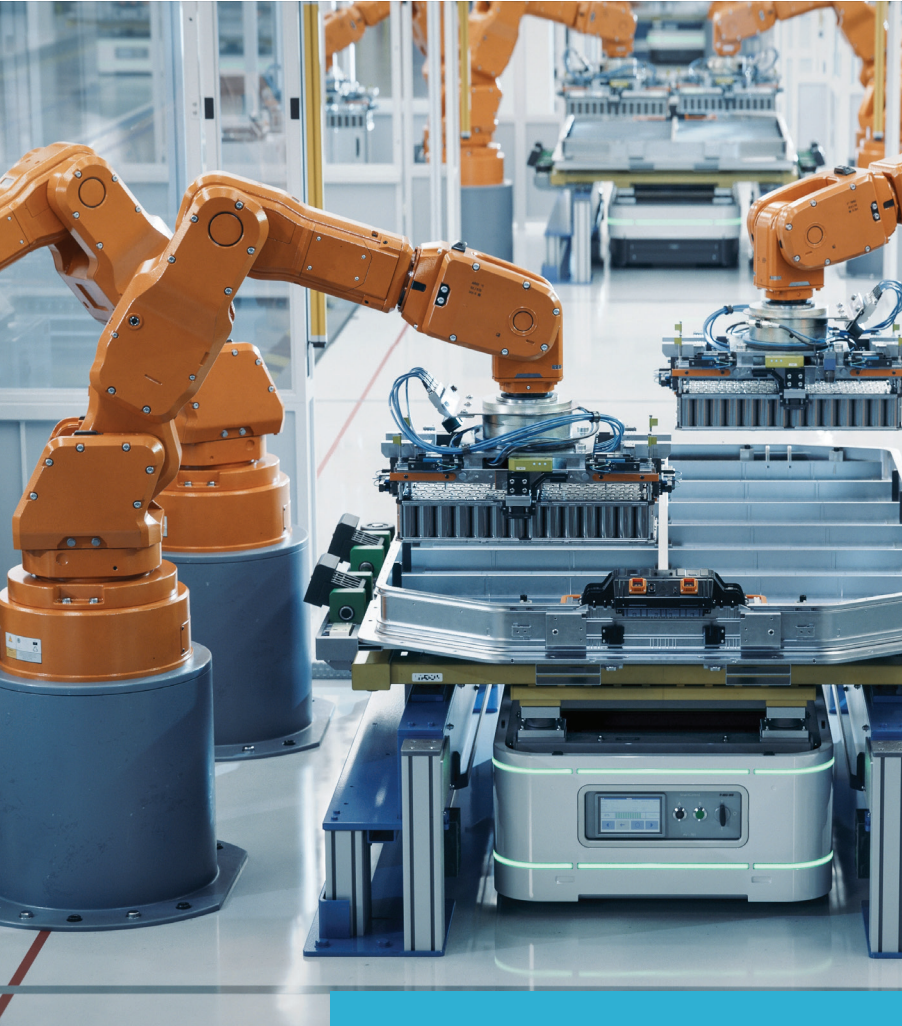
IIT Madras CODE Certificate Program on

BATTERY CELL TECHNOLOGY



code.iitm.ac.in

TABLE OF CONTENTS



03 **ABOUT THE COURSE**

04 **BATTERY CELL MATERIALS**

05 **BATTERY CELL TECHNOLOGY
DEVELOPMENT AND APPLICATIONS
IN ELECTRIC VEHICLES**

About the course:

This 3-month course gives a comprehensive view of materials, characterization, and how it is applied to battery and battery integration with vehicles. This would be useful for engineers who are working on the battery characterization and maintenance side of the auto industry and grid energy storage sector. Besides, it would help researchers to understand the underlying principle and chemistry of battery materials enabling them to venture to new and advanced battery materials development.

Eligibility:

A Bachelor's Degree in STEM (Science, Technology, Engineering, and Math) is required.

Course Mode:

- 36 hours of recorded videos
- 12 hours of online live interactive sessions with the faculty

Course Fees:

Rs 40,000/- + GST

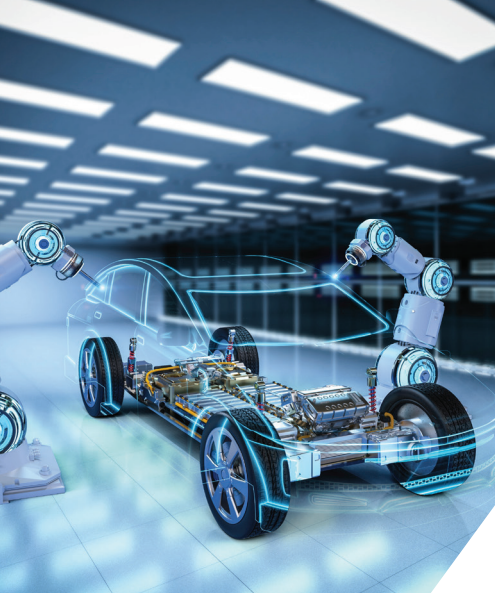
Course start date : **June 1, 2024**

Last date of registration : **May 20, 2024**

FOR REGISTRATION

CLICK HERE





MODULE 1: BATTERY CELL MATERIALS

INSTRUCTOR :

Prof. Kothandaraman Ramanujam
Professor, Dept of Chemistry, IIT Madras



TOPICS COVERED IN THIS MODULE:

- Electrochemical cells
- Voltage loss (overpotential) and Kinetics
- Battery Materials
- Electrochemical Techniques

MODULE DESCRIPTION:

The basics of electrochemistry and how to use it to understand the batteries. Some analogy from commonly known examples will be used to introduce the advanced concepts like overpotential and associated energy loss in batteries, which leads to thermal runaway situations. Besides, the phenomenon responsible for energy storage, such as intercalation, alloying and conversion will be discussed with examples of anode and cathode materials used in the current state of the art Li-ion battery. Besides electrical characterization pertaining to the anode, cathode and whole cell would be discussed in details, particularly non-destructive techniques to understand the state of health and state of charge of battery.



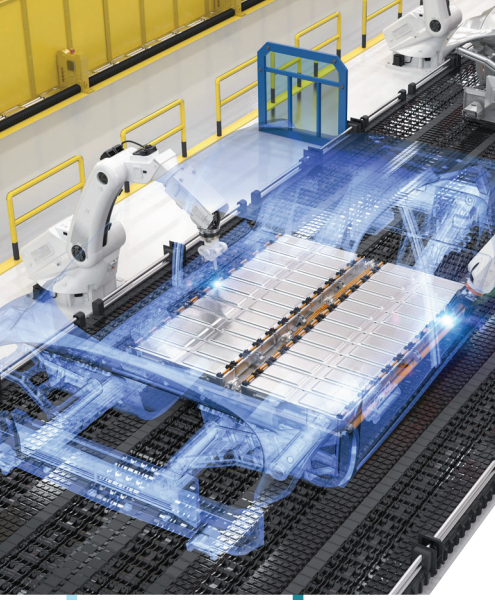
LEARNING OUTCOMES OF THIS MODULE:

- Role of electrodes, electrolytes and their interface
- Importance of solid electrolyte interface in preventing capacity loss in a cell
- What happens with the anode and cathode materials while charging and discharging?
- To design an anode or cathode material
- How mass gets transported from one electrode to another electrode during charge-discharge, leading to energy storage and discharge
- Strategies to avoid dendritic growth which leads to premature failure of the battery and thermal runaway situations.
- Electrochemical methods available to characterize battery materials and what information one gets out of such characterizations.



APPLICATIONS OF THIS MODULE : (industrial areas of application)

- Electric vehicles
- Battery cell manufacturing
- Grid Energy Storage

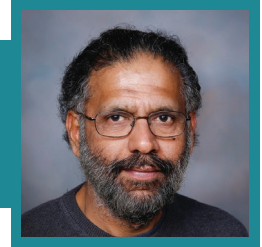


MODULE 2: BATTERY CELL TECHNOLOGY DEVELOPMENT AND APPLICATIONS IN ELECTRIC VEHICLES

INSTRUCTOR :

Dr. Raghunathan K

Professor of Practice, IIT Madras



TOPICS COVERED IN THIS MODULE:

- Basic definitions - Cells in a vehicle, battery metrics
- Anatomy of a cell, internal processes
- Cell materials & cell chemistry
- Cell requirements & specifications
- Cell technology roadmap
- Cell manufacturing process
- Cell design, sizing and cost
- Cell testing and characterization
- Battery performance challenges
- Cell modeling approaches
- Cell diagnostics
- Integration into vehicles
- Battery reuse and recycling
- EV adoption in India - challenges and recommendations

MODULE DESCRIPTION:

This module is focused on cell technologies that are employed in EVs today in India and globally. It provides a perspective from the automakers' (application) point of view: the battery technology selection criteria, implementation into the vehicles, and the challenges they face in ensuring safe and trouble-free experience for the customers, and the tools/processes they commonly use. It also describes the battery ecosystem in India and identifies imperatives for successful EV adoption, calling out indigenous cell manufacturing as a critical need.

LEARNING OUTCOMES OF THIS MODULE:

- Importance of battery technology how it is applied in EVs
- Familiarity with tools and processes related to batteries and how to apply them
- Future technology trends
- Awareness of the entire battery ecosystem in India and related challenges



APPLICATIONS OF THIS MODULE : (industrial areas of application)

- Electric vehicles
- Battery cell manufacturing



EV



Contact Us

Centre for Outreach and Digital Education (CODE)
3rd Floor, IC & SR Building, IIT Madras, Chennai – 600 036.

Call : +91 (44) 2257 4900, +91 (44) 2257 4904 (Mon – Fri 9am – 6pm)

For any queries write to us: [✉ anupama@nptel.iitm.ac.in](mailto:anupama@nptel.iitm.ac.in) | [✉ jayabala@nptel.iitm.ac.in](mailto:jayabala@nptel.iitm.ac.in)