Recent Advancement on Electric Vehicle

Overview

Due to the ever-growing need for higher fuel economy and minimal environmental impacts, advanced battery technologies are being researched for electric vehicles (EVs) at a brisk rate. The improvement of energy and power density of such systems, while improving the overall safety, is the most important energy storage system requirement for plug-in hybrid electric and all-electric vehicles (PHEV and EV). Keeping this fact in mind, this course will primarily discuss critical comparative issues of the most popularly proposed battery storage systems for EVs/PHEVs. This course also addresses the current practical issues in such systems. Characteristics of the main types of energy storage systems will be discussed, including electrochemical batteries, regenerative fuel cells, and electrostatic devices such as ultra-capacitors. The design approach for futuristic combined photovoltaic (PV) and grid infrastructures for EV/PHEV charging will also be presented.

Furthermore, in recent years, Lithium-ion (Li-ion) batteries, although popularly proposed, have been highly uneconomic for EV energy storage, overshooting cost requirements by a large margin. They provide a good solution for EV and PHEV applications, but the main issues include cycle life, calendar life, energy density, power density, and safety. These issues can be addressed successfully by using a simple, practical approach: a power electronics cell voltage equaliser. The purpose of the second part of this seminar is to demonstrate the role of power electronics intensive battery management solutions to reach the cost breakpoint of a PHEV/EV. The Li-ion rechargeable cell has been studied thoughtfully, but there exist no cost analyses of the benefits of using advanced power electronics to protect the cells on board the vehicle. Thus, the seminar will emphasise the importance of power electronics-based solutions and energy management techniques for EVs/PHEVs.

This course will be useful for engineers and managers with entry-level and/or medium-level knowledge of power electronics and motor drives. The talk would also be suitable for engineers with entry-level knowledge of power electronics and motor drive applications for energy storage.

Modules	**Registration link: - https://gian.iitkgp.ac.in/GREGN/index** **Last date of registration: - 15 AUG 2022** **Recent advancement on electric vehicle: 22-26 August 2022** **Number of participants for the course will be limited to fifty.** • **Prof. Sheldon S. Williamson: lectures and tutorials** • **Prof Avik Bhattacharya: lectures and tutorials**
Who Should Attend …	• Executives, engineers and researchers from manufacturing, service and government organisations, including R&D laboratories. • Students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions. • The course will run offline as well as in webcast mode
Fees	The participation fees for taking the course are as follows: **Participants from abroad: USD 100** **Industry/ Research Organisations/ Academic Institutions: INR 3000** **Research scholars/Students: INR 1000** The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on a payment basis.

The primary objectives of the course are as follows:

- Exposing participants to the fundamental architecture of hybrid electric vehicles & Pure Electric Vehicles.
- Understanding of various electric motors based on their performance and selection of suitable ones depending on the specific requirement of an electric vehicle.
- Providing exposure to various control algorithms available for AC motor drive.
- Minimisation of problems related to ruggedness & reliability of the electric vehicle by incorporating sensorless electric drive train design.
- Types of machines suitable for electrical/hybrid vehicle applications and their challenges.
- Understanding the role of power electronics, existing circuitry and their limitations.
- Design of the controls required for this application and their demands from the industry.
- Understanding battery technology.
- Modelling of Electric and Hybrid Electric Vehicles.

The Faculty

Prof. Sheldon S. Williamson is currently a Professor with the Department of Electrical, Computer and Software Engineering and the Director of Smart Transportation Electrification and Energy Research (STEER) Group, Faculty of Engineering and Applied Sciences, Ontario Tech University, Oshawa, ON, Canada. His current research interests include advanced power electronics, electric energy storage systems, and motor drives for transportation electrification. He holds the prestigious NSERC Canada Research Chair position in electric energy storage systems for transportation electrification. He is an Associate Editor for the IEEE Transactions on Industrial Electronics, IEEE Transactions on Power Electronics, IEEE Transactions on Transportation Electrification, and the IEEE Journal of Emerging and Selected Topics in Power Electronics. His main research interests include power electronics, electric energy storage systems, motor drives for transportation electrification and electrified autonomous e-mobility.
https://ontariotechu.ca/experts/feas/sheldon-williamson.php

Prof. Avik Bhattacharya is an Assistant Professor with the Indian Institute of Technology Roorkee, Roorkee, India. Prior to joining IIT Roorkee, he was with the R&D division of Solar Semiconductor, Danfoss Solar Inverter and Samtel Avionics/HAL. During his short stay in the industry, he filed two international patents on the solar pump and power quality. His research interests include power quality, microgrid, electric drive, and power electronics topologies for renewable energies.

https://www.iitr.ac.in/~EE/Avik_Bhattacharya

Course Co-Ordinator

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