PARC

Scheme for Promotion of Academic and Research Collaboration

Scheme for **P**romotion of **A**cademic and **R**esearch **C**ollaboration,
Ministry of Education, Govt. of India

Motilal **N**ehru **N**ational **I**nstitute of **T**echnology Allahabad, Prayagraj

sponsored online **short-term Course** on

UNPACKING E-MOBILITY TECHNOLOGIES FOR INDIA

[*Module-1 of* Emerging and Disruptive Technologies of Electricity Grids]

Duration: 20-24 November 2021 (05 days)

Course Instructor:

Prof. Vassilios G. Agelidis, Fellow, IEEE

About the Instructor: Please refer to the following link- https://ieeexplore.ieee.org/author/37274772300]

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Registration Link: https://forms.gle/PFakvFBsjBhZ6f3v5

Registration Fees - Nil **Last date for registration** - 17 November 2021

TARGET AUDIENCE: **UG, PG, Ph.D. Scholars, Faculty & Professionals from various Academic / Research Organizations and Industries.**

- E-certificates will be provided to participants with a *minimum* of 80% attendance in the Course.
- An online link will be provided to the registered participants.

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ABOUT SPARC:

Scheme for Promotion of Academic and Research Collaboration (SPARC) aims at improving the research ecosystem of India's Higher Educational Institutions by facilitating academic and research collaborations between Indian Institutions and the best institutions in the world from 28 selected nations to jointly solve problems of national and/or international relevance.

ABOUT MNNIT Allahabad

Motilal Nehru National Institute of Technology Allahabad, Prayagraj (MNNIT) is an Institute with total commitment to quality and excellence in academic pursuits. It was established as one of the 17th RE Colleges of India in 1961 as a joint enterprise of the Government of India and the Government of Uttar Pradesh and was an associated college of the University of Allahabad, which is the third oldest university in India. , On June 26, 2002 MNREC was transformed into NIT and Deemed University fully funded by Government of India. With the enactment of NIT Act- 2007(29 to 2007), the Institute has been granted the status of institution of national importance, w.e.f. 15.08.2007. The Mechanical Engineering Department introduced the first Master's Programme of the Institute in 1966, and in all other Engineering Departments, were introduced in 1970-71. To add a new dimension to itself, the Institute established the School of Management studies in 1996, which offers a two-year/four-semester postgraduate degree program in Management (MBA). The Government of India has recognized the Institute as a center for the Quality Improvement Program for M.Tech. and Ph.D. The Institute has a very progressive policy towards extending all possible facilities to its faculty members to acquire higher degrees and receive advanced training. The Institute was selected as a lead institution in the Design theme under Indo-UK REC Project (1994- 99. The Institute has been selected as a Lead Institution under the World Bank-funded GoI project on *Technical Education Quality Improvement Programme* (TEQIP).

COURSE DESCRIPTION

The ever-increasing development and evolution of electrical energy storage continue to enable new applications impacting electricity distribution grids. These applications are disruptive for the grid and may include electric vehicles (EVs) and home/office type of grid storage systems utilizing battery energy storage systems (BESSs). The evolution of grid-connected power electronic converters also affects how such applications are integrated with the grid and their impact. This Course aims to unpack these technologies in the context of the most emerging but disruptive technologies for the grid, namely, EVs and BESSs. The fundamentals of such technologies and their way of designing specific applications will be presented in the Course. Diagnostics, measurement and grid synchronization and control technologies and other intelligent technologies required to enhance the performance of such systems will also be covered.

The Course will deliver competencies, skills and knowledge for the design and assessment of grid impact and performance of emerging and mainly disruptive technologies affecting the electricity distribution grids. These disruptive technologies include battery and supercapacitor energy/power storage for electric vehicles and home/office energy storage applications, respectively and the associated grid-connected power electronics operating as unidirectional/ bidirectional battery chargers and/or energy generation converters. The Course will also cover components and system diagnostics, sensors, measurement, and other related intelligent technologies.

CONTENTS: This Course will unpack the key components of emerging and disruptive technologies impacting the current and future electricity distribution grids. The applications to be considered include electric vehicles and small electricity energy storage systems. The key components include battery and supercapacitors and the power-electronics converters required for the mentioned applications. Charging and grid-connected converter control and diagnostics will be discussed, including sensor technologies, measurement techniques, battery management systems, diagnostics and monitoring technologies. The selection and design of various components will be the driving principle behind the operation, management, control and diagnostics of these disruptive technologies.

The course participants will perform work both independently and as a member of a group/team as required.

LEARNING OBJECTIVES

At the completion of this module, the participant should be able to demonstrate:

[1.] Understanding of the fundamental concepts associated with energy storage options to power electric vehicles.
[2.] Knowledge of data processing, measurement theories, forecasting techniques and modelling of battery technologies suitable for electric vehicles.
[3.] Ability to develop and utilize models for the operation, control, monitoring, diagnostics and prognostics of specific battery technologies utilised currently in market sold electric vehicles.
[4.] Appreciation of system considerations in charging numerous vehicles and coordination of them for the optimal charging of EVs.
[5.] Formulate design requirements of battery and system operation in the context of electric vehicles and associated charging infrastructure.
[6.] Skills in utilizing a commonly used platform, namely MATLAB/Simulink, for the development of theoretical and practical data and information processing linked to the energy storage for electric vehicles.

REFERENCES: IEEE Journal papers, Technical documents, Patents, Manuals, Industry Standards, online resources, etc.

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