



Scheme for Promotion of Academic and Research Collaboration

(Scheme for Promotion of Academic and Research Collaboration)
MINISTRY OF EDUCATION, Govt of India SPONSORED
Course on

ENABLING TECHNOLOGIES FOR ELECTRIC TRANSPORTATION

FROM 30 JULY-19 SEPTEMBER 2021

INAUGURAL : 30 JULY 2021

Organized by:
Electrical Engineering Department
Malaviya National Institute of Technology Jaipur,
Rajasthan - 302017, India
www.mnit.ac.in



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 MNIT JAIPUR

The institute was established in 1963 as Malaviya Regional Engineering College Jaipur. On June 26, 2002 the institute was given the status of National Institute of Technology and proclaimed 'Institute of National Importance'. The institute is fully funded by the Ministry of Education (MOE), Government of India. The institute offers post graduate and undergraduate courses (B.Tech., M.Tech., architecture, MBA, M.Sc. & Ph.D.) in leading fields of engineering, technology, management & science.



Institute has state of art laboratory facilities along with excellent infrastructure for research, consultancy and developmental activities besides imparting regular teaching learning. Located in the central location of Jaipur city, its campus is spread over 325 acres of lush greenery. It is a residential campus offering accommodation to faculty, staff and students. The campus of the institute consists of the institute buildings, halls of residence and staff colony. The campus provides all essential amenities for community living like staff clubs, hospital, bank, post office, community centre, school, staff residences, gymnasium, playing fields, guest houses, 24 hours internet connectivity, and canteen.

ELECTRICAL ENGINEERING DEPARTMENT

The Electrical Engineering Department is one of the oldest department of the institute which was established in the year 1963. At present the department offers both undergraduate and postgraduate Courses in Electrical Engineering. The Department has well equipped laboratories such as Electrical Machines laboratory, Power Systems Laboratory, Control Systems laboratory, Electrical Measurements laboratory, Power Electronics & Drives Laboratory, Electrical workshop & Computer laboratory. The Department has undertaken a number of research projects/schemes with the financial assistance from AICTE, DST and MHRD. The Department is also actively engaged in research, consultancy and testing in the area of Power Systems.

COURSE DESCRIPTION

The transition towards electric mobility offers India not only an opportunity to improve efficiency and transform the transport sector but also addresses several issues that the country is currently grappling with. The concerns regarding energy security and rising current account deficit (CAD) on account of rising fossil fuel imports can be addressed with the uptake of electric mobility. India is a power surplus country and is currently witnessing lower plant load factors due to lower capacity utilization. As per the conservative estimates, demand from electric vehicles (EV) could greatly improve the utilization factor of underutilized power plants, as charging pattern of EV users is considered to coincide with power demand during the non-peak hours in the country.



The new ecosystem offers India the opportunities to become a leader in domestic manufacturing and job creation as electric mobility is still in nascent stages in many advanced markets around the globe. Further, transition to electric mobility can undoubtedly help India achieve its global commitments of reducing carbon footprint and greenhouse gas (GHG) emissions. The batteries in EVs can act as ancillary services for the proliferation of distributed generation resources (DER). Apart from supporting RE generation, EVs with feasible vehicle to grid technology can act as a dynamic storage media and can enhance the grid resilience through ancillary market. This can reduce the burden of exchequer to create static energy storage systems, especially in distribution networks, to support proliferation of grid-connected roof top solar and DERs. However, to accelerate the adoption of electric mobility in India, a lot of preparation needs to be done so that the market grows in a self-sustainable manner with minimal federal support and interventions. The course plans to build up an systematic to deal all these and develop an integrated approach towards it.



COURSE OUTLINE & MODULE DETAILS

Overall course has been divided into 4 modules. This course is designed to extend benefits to all participants without affecting their daily schedule. Therefore, Saturdays and Sundays within this period would be ideal for people from all the backgrounds. Only one time registration is required for all the modules.

ENABLING TECHNOLOGIES FOR ELECTRIC TRANSPORTATION

Module - I [12 Hours]

DC/DC Converters and Multi-Level Inverters

- Transportation electrification and enabling technologies
- Soft-switching techniques in dc/dc converters
- Partial resonance-pulse based current-fed soft-switching dc/dc converters
- Overview of bidirectional dc/dc converters
- Bidirectional soft-switching current-fed PWM dc/dc converters
- Three-phase inverters in electric vehicles
- Bidirectional Pulsating soft dc link inverter for electric vehicles
- Multilevel inverters and their modulation techniques for heavy duty electric vehicles
- Optimal pulse width modulation technique in multilevel inverters
- Battery and fuel cell technologies in electric vehicles
- Vehicle-to-Grid operation
- Vehicle-to-Grid interfacing schemes

31st July - 1st Aug. 2021, 7th - 8th Aug 2021 & 14th - 15th Aug. 2021

Module - III [5 Hours]

Technological Evolution of DC-DC Converter for On-board Chargers

- Introduction to conventional pulse width modulation techniques in DC/DC Converters
- Pulse width modulation advancement
- Soft-switching PWM based DC/DC converter
- Economical configuration of converter
- Economical soft-switched charger configuration

11th - 12th Sept. 2021

Module - II [12 Hours]

Charging System, Batteries, Plug-in, Wireless Charging Small Signal Analysis and Closed Loop Control

- Classification of EV charging systems
- Potential charging systems for 2-wheelers, 3-wheelers, and 4-wheelers
- Power electronics for AC and DC Charging
- AC-DC conversion for plug-in charging: Grid-to-Vehicle (G2V)
- Multifunctional plug-in charger for electric vehicles
- Wireless EV Charging Systems
- Multifunctional wireless charging of electric vehicles
- DCM based 3-phase ac/dc active rectifier topologies for fast EV charging
- Small signal analysis of a power converter
- PI controller design for closed loop control of power electronics system
- Electric motors in electric vehicles
- Research topics for enabling technologies in electric transportation.

21th - 22nd Aug. 2021, 28th - 29th Aug. 2021 & 4th - 5th Sept. 2021

Module - IV [5 Hours]

Career Development

- How to write an IEEE Transactions Paper
- How to write a Good Research Grant
- Career in Industry
- Career in Academia
- Students and Young Professional Development

18th-19th Sept. 2021

Online Tutorial and Online Exam

19th September 2021

COURSE INSTRUCTOR



International PI

Dr. Akshay Kr. Rathore
IEEE Fellow
Concordia University,
Montreal, Canada

Dr. Akshay Kumar Rathore is currently an Associate Professor at the Department of Electrical and Computer Engineering, Concordia University, Canada. He received M.Tech. degree in electrical machines and drives from the Indian Institute of Technology (BHU), Varanasi, India, in 2003, and the Ph.D. degree in power electronics from the University of Victoria, Canada, in 2008. He had two subsequent postdoctoral research appointments with the University of Wuppertal, Germany, and the University of Illinois, Chicago, USA. From November 2010 to February 2016, he was an Assistant Professor with the Department of Electrical and Computer Engineering, National University of Singapore. He has authored or co-authored more than 270 research papers in international journals and conferences, including 92 IEEE transactions. His research interests include current-fed converters and multilevel inverters., Dr. Rathore was the recipient of the 2013 IEEE IAS Andrew W. Smith Outstanding Young Member Achievement Award, 2014 Isao Takahashi Power Electronics Award, 2017 IEEE IES David Irwin Early Career Award, 2020 IEEE Bimal Bose Energy Systems Award, 2020 IAS CMD Outstanding Area Chair Award, 2020 IEEE IES Publications Service Recognition Award and 2021 Nagamori Award.

He is a Distinguished Lecturer and Awards Department Chair of the IEEE Industry Applications Society. He is an Associate Editor for the IEEE Transactions on Industry Applications, and IEEE Transactions on Sustainable Energy. He led and chaired the IEEE IES Technical Committee on Transportation Electrification, IEEE IAS Industrial Automation and Control Committee and IEEE IAS Renewable and Sustainable Energy Conversion Systems Committee.



Indian PI

Dr Arun Kr Verma
Assistant Professor
EE Department
MNIT Jaipur



Indian CO-PI

Dr Ramesh B Battula
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Dr Sandeep N
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Coordinator

Dr Saravana Prakash P
Assistant Professor
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Coordinator

Dr. Kapil Shukla
Assistant Professor
EE Department
MNIT Jaipur

TARGET AUDIENCE

UG, PG, Ph.D Scholars,
Faculty & Professionals from
various Research Organizations
and Industries.

REGISTRATION LINK

<https://tinyurl.com/krbrzu4d>

REGISTRATION FEE

- All Students, Research Fellows and Faculty from MNITJ- NIL
- Other Students and Research Fellows - INR 590/-
- Professionals (Academic and Industry) - INR 590/-

IMPORTANT DATES

Last date for registration
28th July, 2021

Evaluation for all the modules would be conducted at the end of the course. **E-certificates** will only be provided to those participants with 80% attendance and clearing the exam at the end of the course.

VENUE

Online Link will be provided to the registered participants.

COORDINATORS:

Dr. Arun Kumar Verma (PI)
Dr. Sandeep N
Dr. Saravana Prakash P
Dr. Kapil Shukla

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