

SiC Devices Enabled Power Converters Applications- Opportunities and Challenges

Overview

The advent of WBG (SiC and GaN) devices is poised to revolutionize the power electronics applications both in the low power and low voltage applications as well as the Medium Voltage (MV) and High Voltage (HV) applications at high power levels. This course outlines opportunities for HV SiC devices for MV Power Converters and utility applications and the challenges to apply these HV SiC devices successfully.

The course will focus on SiC devices based power electronics applications considering 1200 V to 1700 V SiC MOSFETs, JBS diodes, and 15 kV SiC IGBTs. The course will develop understanding of the high frequency switching characteristics of these SiC devices and their potential application areas.

The potential opportunities and challenges of the HV 10-15 kV devices to enable MV power conversion systems, including the large market space of MV motor drives will be explored in detail. The comparison of HV Si-IGBTs (6.5 kV, 4.5 kV and 3.3 kV) with the HV and high frequency SiC devices for various MV power conversion applications will also be enumerated. The utility applications area of FACTS and VSC based HVDC and in particular MVDC systems can be enabled by these HV SiC devices and this tutorial will include detailed discussions. Challenges in adopting these HV SiC devices for MV power conversion in terms of magnetics, capacitors, insulation materials and impact on lifetime through dielectric losses will also be discussed.

Course participants will learn these topics through lectures and tutorial sessions that reinforce their understanding, while also getting exposure to the avenues for further research.

Dates for the Course	11th to 15th December 2017
Course content	<ul style="list-style-type: none"> ➤ Fundamentals of wide band gap devices, ➤ Modelling and understanding the switching characteristics of SiC devices and their potential applications. ➤ Various control approaches for SiC devices based power electronics applications ➤ Use of HV SiC devices in the area of FACTS and VSC based HVDC and in particular MVDC systems and, ➤ Techniques in adopting HV SiC devices for MV power conversion in terms of magnetics, capacitors, and insulation materials.
You Should Attend If...	<ul style="list-style-type: none"> • You are an Executive/ Engineer /researcher from manufacturing/ service/government organization including R&D laboratories • You are a Faculty from reputed academic institution /technical institution. • You are a Student at any level (B. Tech. / M. Sc. / M. Tech. / M.S/Ph. D.) <p>Number of participants for the course will be limited to fifty.</p>
Course Fee	<p>The participation fee for taking the course is as follows: Participants from abroad: US \$500, Industry Participants: Rs 10,000/- Government Research Organizations: Rs 5000, Academic Institutions: Rs. 3000/- (for faculty), Rs. 2000/- (for Full time Ph.D. students) and Rs. 1000/- (for B.Tech. /M.Tech/M.S and M.Sc. students) The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges. Mode of payment: Demand Draft in favour of "The Director, NIT- Trichy" payable at Trichy. The demand draft is to be sent to the Course Coordinator at the address given in the following. The participants may be provided hostel accommodation, depending on the availability, on additional payment basis. Request for hostel accommodation may be submitted to: gsi.stcnitt@gmail.com</p>

The Faculty



Dr. Subhashish Bhattacharya received B.E. (IIT-Roorkee), M.E. (IISc, Bangalore), and Ph.D. from University of Wisconsin-Madison in 2003, all in Electrical Engineering. He worked in the FACTS group at Westinghouse / Siemens Power T&D during 1998-2005. He was involved in design, development and commissioning of high power converters rated up to 150 MVA for FACTS [Flexible AC Transmission Systems] applications, Convertible Static Compensator (CSC)- two 100MVA Voltage Source Converters (VSC) for STATCOM, UPFC, SSSC, and IPFC applications for New York Power Authority and, series connected IGCT (Integrated Gate Commutated Thyristor) based 3-level NPC inverter poles for FACTS converters up to 250MVA-(EPRI sponsored). He joined Department of ECE at NC State University in August 2005, where he is the ABB Term Professor, and also a founding faculty member of the NSF FREEDM systems center and DOE NNMII Power America. His research interests include FACTS and Utility/Grid Applications of Power Electronics to Power Systems, high power converters with SiC devices, control techniques for power converter systems.



Dr.C.Nagamani is Professor in Department of the Electrical and Electronics Engineering, National Institute of Technology, Tiruchirappalli. Her areas of interest include power electronics and drives, renewable energy systems, and FACTS controllers.



Dr. G. Saravana Ilango is an Assistant Professor in Department of the Electrical and Electronics Engineering, National Institute of Technology, Tiruchirappalli. His areas of interest include FACTS controllers, digital controllers, and renewable energy systems.

Course coordinators

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