

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 with SiC device voltage ranges from 1200 V to 1700 V MOSFETs, and JBS diodes through HV 10 kV - 15 kV 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 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 with 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.

Dates	25th June – 29th June, 2018
Host Institute	Indian Institute of Technology Kharagpur
You Should Attend If...	<ul style="list-style-type: none"> • you are an electrical engineer or research scientist interested in designing of SiC based power converters for medium voltage applications. • you are a student or faculty from academic institution interested in learning the state-of-the-art technology on SiC devices enabled power converters, their control, and related issues.
Course Registration and Fees	<p>Step 1: GIAN Registration A mandatory registration fee of Rs. 500/- to be paid through the GIAN website (http://www.gian.iitkgp.ac.in/GREGN). The registration on GIAN is a one-time affair, i.e. once you are registered on GIAN portal, you may apply for any GIAN course.</p> <p>Step 2: Course Registration Participants from abroad: US \$200 Industry/ Research Organizations: Rs. 5000/- Academic Institutions: Rs. 3000/- (for faculty), Rs. 1000/- (for students) Students of IIT Kharagpur: NIL</p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hrs free internet facility. The participants may be provided with hostel accommodation on payment basis depending on the availability.</p>

The Faculty



Subhashish Bhattacharya received his B.E. (Hons), M.E. and PhD degrees in Electrical Engineering from Indian Institute of Technology-Roorkee (formerly University of Roorkee), India in 1986, Indian Institute of Science (IISc), Bangalore, India in 1988, and University of Wisconsin-Madison in 2003, respectively. He worked in the FACTS (Flexible AC Transmission Systems)

and Power Quality group at Westinghouse R&D Center in Pittsburgh which later became part of Siemens Power Transmission & Distribution, from 1998 to 2005. He joined the Department of Electrical and Computer Engineering at North Carolina State University (NCSU) in August 2005, where he is the ABB Term Professor, and also a founding faculty member and co-PI of NSF ERC FREEDM systems center (www.freedm.ncsu.edu), Advanced Transportation Energy Center [ATEC] (www.atec.ncsu.edu) and the newly established DOE initiative on WBG based Manufacturing Innovation Institute – Power America - at NCSU. He has authored over 250 peer-reviewed technical articles, 2 book chapters, and has 4 issued patents to his credit. A part of his PhD research on active power filters was commercialized by York Corp. for their air-conditioner chiller application. His research interests are Solid-State Transformers, Medium Voltage Power Converters, MTDC, FACTS, Utility applications of power electronics and power quality issues; high-frequency magnetics, active filters, and application of new power semiconductor devices such as SiC for converter topologies. He published more than 200 papers in peer reviewed journals and conferences.



Suman Maiti received his PhD degree from Indian Institute of Technology Kharagpur in 2009. He was associated with the Research and Development (R&D) group of ABB (India) Ltd. as an Associate Scientist from 2009 to 2014. In 2014, he joined in the department of Electrical Engineering, Indian Institute of Technology Kharagpur as an Assistant

Professor. His research interests include topology evaluation and control of multilevel converters for high power applications, AC/DC microgrids, Renewable integration and related issues.

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Course Co-ordinator

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