WIDE BANDGAP DEVICES & APPLICATIONS SHORT COURSE

November 13–15, 2018 | NC State University, Raleigh, NC

COURSE BENEFITS

Enable power electronics engineers to incorporate SiC and GaN technology into products and systems, and fully utilize the benefits of this technology.

Earn Professional Development Hours (PDH) and/or Continuing Education Units (CEU) upon completing the short course.

COURSE OBJECTIVES

Provide the basics of SiC and GaN power electronics technology. Participants gain proficiency through instruction of WBG fundamentals, application-specific case studies and hands-on laboratory demonstrations.

WHO SHOULD ATTEND

- POWER ELECTRONICS APPLICATIONS ENGINEERS
- POWER DEVICE ENGINEERS
- SiC & GaN TECHNICAL MARKETING PROFESSIONALS
- POWER ELECTRONICS BUSINESS & PRODUCT LINE MANAGERS

INSTRUCTORS

Victor Veliadis, PhD
Deputy Executive Director and CTO, PowerAmerica

Jon Zhang, PhD
WBG Device Director, PowerAmerica

David Levett, PhD
Power Electronics Design and Applications Engineer, Infineon Technologies

Elif Balkas, PhD
R&D Manager-Materials, Wolfspeed

Al Burk, PhD
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Qiang Li, PhD
Professor, Virginia Tech

Fred Wang, PhD
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Iqbal Husain, PhD
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Subhashish Bhattacharya, PhD
Professor, North Carolina State University

Julian Styles
Director of Business Development, GaN Systems

EARN CREDIT

Continuing Education Units (CEU)	2
Professional Development (PDH)	20

COURSE FEE

$1200 PowerAmerica member
$1800 PowerAmerica non-member
Covers: Instructional material, breakfast, break snacks and lunches

LOCATION

PowerAmerica Institute
North Carolina State University
Raleigh, NC 27606

REGISTRATION ONLINE AT: PowerAmericaInstitute.org/shortcourse

SCHEDULE

Day 1 8 a.m. – 5 p.m.
Day 2 8 a.m. – 5 p.m.
5:30 – 7 p.m. Networking Reception
Day 3 8 a.m. – 2:30 p.m.

COURSE OUTLINE

Silicon, GaN and SiC: There's Room for All

- Market trends and drivers
- Implications to system performance
- Device performance differences in applications
- Challenges for all technologies

Practical Implementation of SiC MOSFETs for Power Converter Design

- Si IGBT's and SiC MOSFET's similarities and differences overview
- Gate driver design and PCB layout
- Thermal design and packaging
- Real world design example of a motor drive
- Long term reliability and design margin

WBG Modules & Packaging and Impact on Circuit Design

- Electrical design challenges for WBG devices
- Packaging processes, materials and design requirements
- Advanced packaging technologies
- Brief introduction to multiphysics concepts and analysis
- System level considerations of WBG power modules
- Module design case study

GaN Power Devices and Applications Reliability

- Motivation for GaN FET
- The meaning of traditional qualification — what does and does not carry over from Si reliability
- Intrinsic reliability of GaN FET — dynamic Ron & TDDB
- Application reliability & robustness — hard switching reliability

SiC Power Device Technology

- Bulk Substrate
- Epitaxy
- Design and Fabrication

WBG Power Electronics Lab Tour and Demonstration

- WBG module assembly
- MV SiC EV fast charger
- SiC traction inverter
- High Voltage converters

WBG Power Electronics Case Studies:

Medium Voltage EV Fast Charger System

- Converter topology selection
- Device selection and characterization
- System modeling and simulations
- Control system specification
- Prototype development and testing
- Schematics and PCB design, hardware assembly and testing
- Control code development and debugging
- System optimization to meet the design requirements

SiC Traction Inverter for Electric and Hybrid Vehicles

- EV Powertrain system modeling and simulation WBG EV traction inverter
- Power stage, gate driver, and controller
- WBG circuit design for high frequency, high temperature operation and EMI suppression
- Passive component sizing and selection
- System benefits of WBG insertion

High Voltage SiC Power Device Characterization and Converter Applications

- High voltage SiC device characterization
- Gate drive isolation, short circuit protection and switching performance
- Power converter design considerations High frequency magnetics
- Solid state transformers and MV motor drives
- Autonomous grid connector — for grid interconnection of microgrid to grid / microgrid

WBG Based High Efficiency Power Architectures for Data Centers

- WBG based power architectures for data centers and their benefits
- Magnetic components for high frequency data center power converters.
- EMI suppression for high frequency data center power converters
- Digital control for high frequency data center power converters

Power Electronics for Grid Applications

- Overview of power electronics for grid application
- Emerging needs and challenges
- Opportunities and research needs introduced by WBG and other new technologies
- Highlights of ongoing research and development

GaN Automotive Power Electronics

- GaN based EV Charger: topology and simulation
- Design of power loop, gate-drive loop, and controller
- Thermal analysis and design
- GaN in EV accessory power module (APM) and inverter