COURSE BENEFITS
Enable industrial 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 experience through applications-specific examples 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
David Reusch, PhD | Executive Director of Applications Engineering, Efficient Power Conversion Corporation (EPC)
David Levett, PhD | Power Electronics Design and Applications Engineer, Infineon Technologies
Doug Hopkins, PhD | Professor, North Carolina State University
Ty McNutt, PhD | Director of Business Development, Wolfspeed
Srdjan M. Lukic, PhD | Associate Professor, North Carolina State University
Iqbal Husain, PhD | Director of the FREEDM and ABB Distinguished Professor, North Carolina State University
Subhashish Bhattacharya, PhD | Professor, North Carolina State University
Elif Balkas, PhD | R&D Manager, Wolfspeed
Al Burk, PhD | Engineering Manager, Wolfspeed

COURSE FEE
$1200 PowerAmerica member
$1800 PowerAmerica non-member
Covers: Instructional material, break refreshments, breakfast, lunches, Wednesday networking dinner

EARN CREDIT HOURS
Continuing Education Units (CEU) 2
Professional Development (PDH) 20

REGISTRATION ONLINE AT
poweramericainstitute.org/shortcourse

LOCATION
PowerAmerica Institute
North Carolina State University
930 Main Campus Drive, Suite 200
Raleigh, NC 27606
SCHEDULE

Day 1  8-8:30 a.m. Registration
       8:30 a.m-5:30 p.m. Class and Laboratory

Day 2  8 a.m.-5:30 p.m. Class and Laboratory
       5:30-8:30 p.m. Networking Dinner Event

Day 3  8 a.m.-12:30 p.m. Class and Testing Tools

COURSE OUTLINE

Opening session: Executive Overview

Power GaN Transistor Design Fundamentals and Application
  ▪ Where is the state-of-the-art today
  ▪ Gate drive requirements and considerations
  ▪ Layout techniques for high frequency switching
  ▪ Paralleling GaN transistors
  ▪ Dead-time requirements
  ▪ Thermal management
  ▪ High speed measurement techniques
  ▪ Design Examples

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
  ▪ EMI effects and control
  ▪ Thermal design and packaging
  ▪ Real world design example of an EV charger
  ▪ Long term reliability and design margin

Introduction to WBG Module Packaging and Impact on Circuit Design
  ▪ Electrical design challenges for WBG devices
  ▪ Packaging processes, materials and design requirements
  ▪ Advanced packaging technologies
  ▪ Full design case study, design creation and hands-on lab experience
  ▪ Common failure mechanisms and reliability testing
  ▪ System level considerations of WBG power modules

Application of WBG Power Electronics: Power Converters, Electric Vehicles and Motor Drives

MV Fast Charger System Specification, Design Requirements
  ▪ 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
  ▪ Demos: MV SiC fast EV charger

WBG SiC 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

HV 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

WBG Power Device Fundamentals
  ▪ SiC substrates and epitaxy
  ▪ SiC device design and fabrication
  ▪ WBG devices roadmap and cost projections
  ▪ WBG devices characterization: tools and techniques
  ▪ High Voltage device testing lab tour
  ▪ NCSU foundry tour