

# **WIDE BANDGAP DEVICES & APPLICATIONS**

*(Participants will receive an IEEE PDH or IEEE CoP certificate)*

## **COURSE BENEFIT**

Attendees will gain comprehensive insight into power SiC and GaN materials, devices, and insertion of these technologies into power electronics systems.

## **WHO SHOULD ATTEND**

- Power Electronics Applications Engineer
- Power Device Engineer
- SiC & GaN Technical Marketing Professionals
- Power Electronics Business & Product Line Managers

## **COURSE FEE**

\$50 Students

\$500 PowerAmerica Members

\$1100 PowerAmerica non-members

## **REGISTRATION**

[poweramericainstitute.org/2026-short-course/](http://poweramericainstitute.org/2026-short-course/)

## **SCHEDULE**

Feb. 3<sup>rd</sup> : 10:50 AM – 5:15 PM

Feb. 4<sup>th</sup> : 11:00 AM – 5:15 PM

Feb. 5<sup>th</sup> : 11:00 AM – 5:15 PM



**Sponsor**



REGISTER ONLINE: [poweramericainstitute.org/2026-short-course/](http://poweramericainstitute.org/2026-short-course/)  
For questions, email [poweramerica@ncsu.edu](mailto:poweramerica@ncsu.edu).

## INSTRUCTOR & COURSE OUTLINE

### **Instructor: Dallas Morisette, Ph.D.**

Research Professor, Purdue University

#### **Topic: Fundamentals of SiC Power MOSFET Design**

- Physics of avalanche breakdown
- Relationship between breakdown voltage and on-resistance
- SiC MOSFET design optimization
- Unique aspects of SiC power device design and fabrication compared with silicon
- Planar and trench devices
- Edge termination
- Layout considerations

### **Instructor: Johann W. Kolar, Ph.D.**

Researcher

#### **Topic: Next-Generation Bidirectional GaN/SiC Switch**

##### **Power Electronics**

- Basic Properties and Multi-Step Commutation of Bidirectional Switches
- T-Type Voltage Source and Current Source Variable Speed Motor Drives
- Ultra-Compact Bidirectional Three-Phase EV Chargers
- Ultra-Efficient AI Datacenter Power Supplies
- Single-Stage MVAC/LVDC Solid-State Transformers
- Solid-State Circuit Breakers

### **Instructor: Matteo Meneghini, Ph.D.**

Professor, University of Padova

#### **Topic: GaN Power Devices: Technology and reliability-limiting processes**

- Overview on GaN technology and advantages
- Charge trapping phenomena in GaN-based devices
- Advanced methodology for stability investigation for GaN FETs

### **Instructor: Mike MacMillan, Ph.D.**

Consultant

#### **Topic: Silicon Carbide Epitaxy Technology**

- SiC epitaxy – basics of growth
- Substrates and growth parameters
- SiC epitaxy tools
- Next-generation tools and techniques
- Characterization techniques and requirements for commercial epitaxy
- Thickness and doping accuracy and uniformity
- Defect types and control

### **Instructor: David Levett, Ph.D.**

Consultant

#### **Topic: Paralleling SiC MOSFETs**

- Overview of the challenges of paralleling SiC MOSFETs
- Power layout optimization
- Gate drive design guidance
- Converter testing for reliable operation in the field

### **Instructor: Elif Balkas, Ph.D.**

CTO, Wolfspeed

#### **Topic: Silicon Carbide Substrates: Advantages, Challenges and Solutions**

- Motivation for SiC
- SiC advantages in power electronics
- SiC substrate technologies and processing
- SiC defects, surface quality, flatness

### **Instructor: Don Gajewski, Ph.D.**

Sr. Director, Wolfspeed

#### **Topic: SiC Power Device Reliability**

- Intrinsic reliability failure mechanisms & models
- Dynamic reliability – new methods & results
- Radiation hardness - terrestrial neutrons
- Product-level qualification & reliability
- Reliability for high voltage and high humidity environments
- Industry consortia guidelines & standards development

### **Instructor: Sandeep Bahl, Ph.D.**

Distinguished Member of Technical Staff

Texas Instruments

#### **Topic: Reliable GaN FETS for Power Supply Applications**

- Motivation for the GaN FET
- The meaning of traditional qualification
- Intrinsic reliability of the GaN FET
- Achieving application-reliable GaN
- Surge robustness without avalanche

### **Instructors: Gregory Ratcliff and Brian Heber**

Chief Innovation Officer, Vertiv

#### **Topic: Advancing Wide Bandgap Power Electronics: SiC and GaN Innovations for Next-Generation Energy Systems**

- Today's Architectures
- Future Architectures
- Challenges vs. Benefits
- Market Adoption & Future Gazing

### **Instructor: Rambabu Adapa, Ph.D.**

Technical Executive, EPRI

#### **Topic: Role of Wide Band Gap power electronic devices in Power Grid Modernization with Renewables**

- Power Grid Architectures with renewable generation
- Meeting the power requirements for new loads such as AI data centers
- WBG device power requirements for Power Grid applications
- Future R&D needs for Power Grid Modernization and the role of WBG power electronics

### **Instructor: Thomas Jahns, Ph.D.**

Faculty, University of Wisconsin

#### **Topic: Monolithic GaN Bidirectional Switches: Where to Apply Them and How**

- Matrix and cycloconverter-type single-stage converters
- Vienna rectifiers and T-type multi-level inverters
- Current source inverters/converters
- BD device switch states and gate drive technology
- Four-step commutation sequence and simplifications

### **Instructor: Isik Kizilyalli, PhD.**

CEO and Entrepreneur

#### **Topic: GaN and Related Materials - Device Processing and Materials Characterization for Power Electronics**

- GaN material properties for power applications
- Bulk GaN substrates and epitaxial growth
- Selective area p-type GaN doping
- Vertical GaN power devices
- Novel material characterization for GaN power devices
- Future WBG directions and impact on critical applications

## INSTRUCTOR & COURSE OUTLINE

**Instructor: Burak Ozpineci, Ph.D.**

**Section Head, Oakridge National Laboratory**

**Topic: Electric Drive Technologies for Commercial Vehicles**

- Reliable Long-Life Electric Drive Systems
- Electric drives for commercial vehicles vs. passenger vehicles
- AI and Digital Twin Integration
- Motor AI for Advanced Design

**Instructor: Victor Veliadis, Ph.D.**

**Executive Director & CTO, PowerAmerica**

**Professor, North Carolina State University**

**Topic: SiC Fabrication in a Si Fab**

- SiC material properties for power devices and applications
- Planar and trench MOSFETs
- SiC specific fabrication technology: Etch, Implantation, metallization and ohmic contact formation, gate oxide processing

**Instructor: Victor Veliadis, Ph.D.**

**Executive Director & CTO, PowerAmerica**

**Professor, North Carolina State University**

**Topic: WBG Bidirectional Switches**

- Introduction to WBG bidirectional switches and applications
- Lateral GaN bidirectional switches with dual-gate configuration
- Vertical SiC bidirectional switch concepts  
Bidirectional DC circuit breakers