



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Design and Process Integration for Wide Band Gap Power Devices

ECE 6244

Credit Hours:

3.00 - 3.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Design and processing of wide band gap power devices (including SiC, GaN and ultra wide band gap semiconductors) and reliability considerations. 2D device simulations, layout considerations for power chip from 600 V to 15 kV.

Prerequisites and Co-requisites:

Prereq: Grad standing in Engineering or Physics.

Course Goals / Objectives:

- Provide an introduction to basic operation of WBG power devices
 - Students master design principles and 2D simulations of power devices
 - Students become competent with layout of power device chips
 - Students are exposed to the processing details of power devices
 - Students become familiar with reliability and qualification of power devices
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Course Topics:

- Review of semiconductor basics
 - Operation and characteristics of the SiC Schottky Barrier Diode, SiC DMOSFET and GaN HEMT
 - 2D simulations of 1700 V SiC Schottky Barrier Diode, DMOSFETS and 600 V GaN HEMT and design considerations for edge termination, dv/dt , short circuit time, avalanche ruggedness, design for HTRB, optimization of on-resistance etc.
 - Process Integration: Overall process sequence for SiC Schottky Diode, SiC MOSFET and GaN HEMT and unit processes
 - Layout of the 1700 V SiC Schottky Barrier Diode, DMOSFET and 600 V GaN HEMT
 - Misc. Topics: Thermal and yield considerations, qualification and reliability, cost of manufacturing, availability of substrates and epilayers, worldwide manufacturing of SiC and GaN devices and supply chain
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Designation:

Elective