



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Solid State Electronics and Photonics Laboratory

ECE 5037

Credit Hours:

4.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Lab

Course Description:

Introduction to laboratory techniques for semiconductor device fabrication including photolithography, oxidation, diffusion, chemical processes, reactive ion etching, and metallization; fabrication and measurements of visible light emitting diodes (LED) and GaN High Electron Mobility Transistor (HEMT).

Prerequisites and Co-requisites:

Prereq or concur: 3030, and acceptance in ECE, MSE or EngPhysics major; or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

Course Goals / Objectives:

- Be competent with the basic techniques for fabrication of LEDs and GaN HEMTs
 - Be competent in applying knowledge learned in prerequisite semiconductor devices courses to fabrication of LEDs and GaN transistors, other semiconductor devices, and test structures
 - Be competent in performing current-voltage characterization of semiconductor devices and test structures fabricated in lab
 - Be competent in performing optical characterization of semiconductor devices and test structures fabricated in lab
 - Be competent in extraction of device parameters from and analysis and interpretation of test results
 - Be familiar with cleanroom procedures, and with safe use of the hazardous materials and equipment used in semiconductor device fabrication
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Course Topics:

- Lab safety, overview of class
 - Theory of LEDs and process overview
 - Epitaxial Growth
 - Theory of XRD and PL Characterization
 - LED L-I optical characterization
 - Wafer Cleaning
 - Photolithography; photomask alignment, tolerances and layout
 - Reactive ion etching
 - Metal contact deposition - evaporation and sputter deposition
 - Sheet resistance, four-point probe
 - Rapid Thermal Anneal
 - Overview of GaN HEMT Theory and Process
 - Gate dielectrics and passivation
 - Ion implantation
 - Electrical testing of I-V characteristics
 - Introduction to working in a cleanroom, initial silicon wafer characterization, wafer cleaning
 - LED Processing and characterization
 - GaN HEMT processing and characterization
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Designation:

Elective