



#### Contact:

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<http://www.ces.clemson.edu/electronics/>

The primary research emphasis lies in the field of Solid State Nanoelectronics. The major thrust focuses on materials, processing, devices, characterization and reliability of future integrated circuits. The primary semiconductor materials of interest are elemental Si and IV-IV compound materials, such as SiC. In addition, significant research into processing and characterization of thin film high-k dielectric materials such as Hafnium oxide, is being pursued. This research contributes to expanding the applications of Si-based microelectronics technology from low power to high power, and from dc to high-frequency, as well as reducing device size to the nanometer scale. A secondary outcome is the development of process equipment for semiconductor manufacturers. Because of the huge investment in Si technology as opposed to more exotic materials, this expanded range of applicability is of great benefit to the semiconductor industry. Interdisciplinary research applies this technology to the development of a variety of sensors, such as dosimeters and molecular gas sensors in collaboration with the Physics department.

#### FACILITIES:

##### Riggs Hall

CAD Laboratory: Equipped with 11 PC's running PC Spice (full version) and 8 Sun workstations running Mentor Graphics CAD tools and Berkeley 3f5 Spice.

Microstructure laboratory: A 2000 sq ft class 100 cleanroom, equipped with photolithography, mask making, metal deposition, film thickness and other measurement equipment. Scribing, bonding, ovens and other small process equipment are available.

UHV MOCVD and MBE equipment is housed in the rooms adjacent to the cleanroom.

Measurement equipment including an I-V and C-V probe station, a 4-point probe resistivity station, and DLTS system are located in the Metrology laboratory.

##### Rhodes

Process Laboratory: RTPP equipment for deposition of high and low-k dielectric materials is located in the 1500 sq foot cleanroom in Rhodes Hall.

**RESEARCH FOCUS:**

Semiconductor Devices: M-S interfaces, device modeling, Si-C, and organic polymer materials and devices.

Semiconductor Processing: Ultra Violet assisted Rapid Thermal Processing Chemical Vapor Deposition (UVRTPCVD) of thin films for solar cells, flat displays, and large silicon wafers.

Integrated Circuit Design: A/D custom, standard cell, testable chip design and CAD tool development.

PATENTS: Teflon Deposition; Reliability Prediction.

FUNDING SOURCES: Include NASA, KEMET, SRC, DOD and NSF

**DEGREES:**

MS (coursework option)

MS (thesis option)

Ph.D.

**COURSES:**

ECE-604: Semiconductor Devices

ECE-606: Intro Microelectronics Processing

ECE-622: Electronic System Design

ECE-659: Integrated Circuit Design

ECE-811: Integrated Circuit Design

ECE-823: Integrated Circuit Technology

ECE-840: Physics of Semiconductor Devices

The 6xx level courses provide a strong base covering, processing, devices, analog and digital circuits. CAD tools include extensive use of mixed mode circuit simulators, PC Spice, and process/device simulators Athena/Atlas (Silvaco).

The 8xx level courses cover in depth topics. Design tools include the use of Mentor Graphics CAD tools.

**EMPLOYMENT:** Graduates are employed by a wide variety of companies such as Micron, Texas Instruments, Infineon, Altera, Qualcomm, Freescale, Intel, and AG Associates.