**Course Topics**

**EEE 536:** Semiconductor Characterization

**Catalog Course Description:** Measurement techniques for semiconductor materials and devices. Electrical, optical, physical, and chemical characterization methods.

**Prerequisites:** A basic introductory device physics course such as EEE 436 or equivalent.

## *Course Topics*

### Electrical Characterization

1. Resistivity

2. Carrier/Doping Densities

3. Contact Resistance

4. Series Resistance

5. Schottky Barriers

6. MOSFET Channel Length

7. Threshold Voltage

8. Defects, Impurities

9. MOS Capacitors

10. Oxide Charges, Interface States

11. Carrier Lifetime

12. Mobility

13. Charge-based Measurements

14. Probe Microscopy

15. Reliability

Electromigration

Hot Carriers

Negative Bias Temperature Instability

Gate Oxide Integrity

16. Failure Analysis

Emission Microscopy

Voltage Contrast

Liquid Crystal

Optical Beam Induced Resistance

Change

### Optical Characterization

1. Optical Microscopy

2. Ellipsometry

3. Transmission, Reflection

4. Photoluminescence

5. Emission Microscopy

### Physical/Chemical Characterization

1. Scanning Electron Microscopy

2. Auger Electron Spectroscopy

3. Transmission Electron Microscopy

4. Voltage Contrast

5. Secondary Ion Mass Spectrometry

6. Rutherford Backscattering

7. X-Ray Fluorescence

8. X-Ray Photoelectron Spectroscopy