

# **Electronic, Optical, and Magnetic Properties Laboratory**

# **MATSCEN 5532**

#### **Credit Hours:**

1.00

#### **Course Levels:**

Undergraduate (1000-5000 level) Graduate (5000-8000 level)

#### **Course Components:**

Lab

## **Course Description:**

Correlates electronic, optical, and magnetic properties of materials with structure, composition, and microstructure. Examples include resistivity, the Hall effect, and ferromagnetic/ferroelectric hysteresis.

## **Prerequisites and Co-requisites:**

Prereg: 3141, 3261, 3271, 3332, and enrollment as MatScEn-BS major student; or permission of instructor.

## Course Goals / Objectives:

- Learn the principle of current/voltage measurement using 4 contact method, intrinsic versus extrinsic properties
- Learn principles of the Hall effect including measurement of charge carrier type, electron or hole, and charge carrier mobility
- Learn principles of optical absorption and photovoltage. Measure photovoltage versus wavelength for intrinsic-Si, p+ or n+ Si, and a pn photodiode
- Measure the magnetization of ferromagnetic metals, paramagnetic metals, and diamagnetic insulators
- Measure polarization of ferroelectrics as a function of electric field

## **Course Topics:**

- 4-pt resistivity: Objective: Learn the principle of current/voltage measurement using 4 contact method, intrinsic versus extrinsic properties
- Hall effect: Objective: Learn principles of the Hall effect including measurement of charge carrier type, electron or hole, and charge carrier mobility
- Photovoltage: Objective: Learn principles of optical absorption and photovoltage. Measure photovoltage versus wavelength for intrinsic-Si, p+ or n+ Si, and a pn photodiode
- Magnetic memory materials: Objective: Measure the magnetization of ferromagnetic metals, paramagnetic metals, and diamagnetic insulators
- Ferroelectric materials Polarization of ferroelectrics as a function of electric field

# **Designation:**

Elective