

**MATSE 463: CHARACTERIZATION AND PROCESSING OF ELECTRONIC AND PHOTONIC MATERIALS LAB ORATORY**

**Course Designation:** Required

**Catalog Description:** Provides experience with key processing methods for EPM materials and advanced characterization methods for EPM materials and simple device structures.

**Course Description:** Students in MATSE 402 learn about the processing and characterization of electronic materials, focusing on metals, oxides, and compound semiconductors. Students learn about how process variables affect the performance of the metallizations, as examined using electrical measurements, scanning electron microscopy, transmission electron microscopy and atomic force microscopy. Students investigate the dielectric and optical properties of oxides, and they learn about differences between Si and the leading compound semiconductor GaAs through examination of the crystallography and chemical etching of this semiconductor. This course is a requirement for students in the Department of Materials Science and Engineering pursuing the electronic and photonic materials degree option. Students' grades are based on written laboratory reports and observation of the students' laboratory activities by the professor. It is offered during fall semesters.

**Prerequisites:** MATSE 400, 430, and 461; Concurrent: MATSE 450 and 455

**Textbook:** Lab Handouts

**Course Objectives:**

1. To be able to apply knowledge of advanced science and engineering principles to process and characterize electronic and photonic materials.
2. To be able to design a thin film process to achieve a film with desirable properties at a minimum cost.
3. To be able to work effectively in teams.
4. To be familiar with the roles of Si and compound semiconductors in the electronics industry.

**Course Topics:**

1. Sputter Deposition
2. Materials Characterization (Resistivity, SEM, TEM, AFM)
3. Metallization
4. Electroceramics
5. Compound Semiconductors

**Class Schedule:** 1 laboratory session (3 hours) per week

**Contribution to ABET Professional Component:** Students will gain hands-on experience processing and characterizing materials that they may encounter as engineering professionals. They will improve their written communication skills and gain more experience working in teams.

**Course Outcomes:**

1. Students will have hands-on experience with the vacuum deposition and characterization of thin metal films similar to those used in microelectronics today.

2. Students will understand the origins of electrical resistivity in thin metal films and how processing variables affect resistivity.
3. Students will understand differences between the most commonly used semiconductor Si and the leading compound semiconductor GaAs through studies of the crystallography and chemical etching of GaAs.
4. Students will be familiar with oxides used as electronic and optical materials.
5. Students will be able to work on a team to collect and analyze data.
6. Students will be able to use information from research journals and other sources to design experiments and analyze data.
7. Students will have improved upon skills already learned in previous laboratory classes for the preparation of written laboratory reports.

**Prepared by:** Suzanne Mohny, Associate Professor, February 12, 2002

<b>MAP TO DEPARTMENTAL OUTCOMES (For further detail, see coursebook)</b>											
<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>	<b>h</b>	<b>i</b>	<b>j</b>	<b>k</b>	<b>l</b>
1	1	1	2	2	3	1	3	2	2	1	1

<b>MAP TO DEPARTMENTAL OBJECTIVES (For further detail, see coursebook)</b>						
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>	<b>(7)</b>
1	1,4	1,2	1,2	3	1	