MSE-472 Surface Analysis and Characterization

Credit Hours: 3-0

Pre-requisites: None

Course Objectives

- To understand surface crystallography and defects compared with bulk crystalline solids
- To introduce various surface modification techniques
- To present fundamentals of thin film technology with emphasis on select thin film deposition processes
- To foster sound knowledge of some of the modern surface characterization techniques

Course Contents

- Measurement of Surface tension and Surface Stress
- Contact Angle techniques and measurement
- Ion Mediated and Van Der Vaal Forces through Atomic Force Microscope, measurement through electro-osmosis
- X Ray Photoelectron Spectroscopy (XPS) of surface
- Field Ion Microscopy
- Low Energy Electron Diffraction Spectroscopy (LEEDS), Ion Scattering Spectroscopy (ISS)
- Secondary Ion mass Spectroscopy (SIMS)
- Rutherford Back Scattering (RBS)
- Dynamic Light Scattering
- Small Angle X Ray Scattering (SAXS), High Resolution Electron Energy Loss Spectroscopy (HREELS)
- Auger Electron Spectroscopy (AES), Electron Scattering for Chemical Analysis (ESCA)

Course Outcome Once the semester is over, the students must be able to:

- effectively describe any surface in terms of its crystal structure and physical properties

- explain the importance and relevance to different modification techniques to certain applications
- describe salient features of various surface modification techniques
- suggest ways to change/modify surface using thin film deposition techniques
- explain working principle and interpret information obtained using surface analysis techniques

Suggested Books

- Andrew J. Milling, *Surface Characterization Methods: Principles, Techniques, and Applications, Marcel Dekker, 1999.*
- Charles Evans, Richard Brundle, and Wilson, *Encyclopedia of Materials Characterization: Surfaces, Interfaces, Thin Films (Materials Characterization Series) Gulf Professional Publishing, 1992.*