

MSE 954 Advanced Characterization of Materials

CHs: 3

Pre-requisites: Nil

Course Objective:

- To learn the principles of different techniques, XRD, SEM, ESEM, EELS
- To understand the concept of different techniques for different purposes
- To learn the how to find the chemical composition using EDX
- To learn the application of different techniques

Course Contents:

- Electron Microscopy: Principles of electron optics and Design of important components of electron optical instruments,
- Beam-Matter interaction, Scanning Electron Microcopy (SEM),
- Environmental Scanning Electron Microscopy (ESEM),
- Transmission Electron Microscopy (TEM); Electron Diffraction,
- Convergent Beam Electron Diffraction (CBED),
- Analytical methods using X-ray microanalysis (EDX) and Electron
- Electron Energy Loss Spectroscopy (EELS), Specific X-ray Analysis Techniques,
- Signal crystal diffraction, Secondary IonMass Spectroscopy-SIMS;
- Mass Detection, Time of Flight (ToF) Mass Spectroscopy.
- Molecular Absorption and Emission Spectroscopy.

Course Outcomes:

- The students are able to apply different techniques for characterization of samples
- The student are able to find the structure of materials
- To apply techniques for the surface morphology of samples
- To know the range of testing techniques available for testing of materials
- To understand which technique is useful for analysis and characterization
- To develop the knowledge to know which technique is suitable for obtaining the required properties of materials

Recommended Text/ Reference Books

- Electron Beam Analysis of Materials, MH Loretto
- Encyclopedia of Materials Characterization, Surface, interface, Thin Films, C. R. Brundle, C.A. Evans, S. Wilson, eds, Butterworth-Heinamann.
- Elements of X-ray Diffraction, B.D. Cullity and S. R. Stock
- Molecular Spectroscopy, Banwell and McCash
- Characterization of Materials, 2 Volumes, Elton N. Kauffman