

Add on Course/value added course under CBCS: 4 credits (40 hours)

(can be taken by Final year Physics, Chemistry, Geology & Biotechnology students)

Basic Materials Characterization and Instrumentation Techniques

Objectives:

- Understand different characterization technique for the material characterization
- Understand Raman and UV- characterization for optical and Raman active materials
- Study the Data Acquisition and Processing different vacuum pumps and their applications
- Understand the different Nuclear radiations and detectors

Unit I

General Purpose Characterization Instruments

Commonly used techniques for characterization – X-Ray diffractometer, Electron microscopes, Raman Spectrometer, UV-Visible spectrophotometer, magnetic resonance equipments, electrical conductivity measurement, magnetic susceptibility measurement

Unit II

Vacuum Technology

Units used to describe vacuum, Nature of the Residual Gases in a Vacuum System, Gas flow in a pumping system, Out gassing, Various types of vacuum pumps and their operating range (Rotary pump, Turbomolecular pump, Vapor diffusion pump, Sorption Pumps, Getter Pumps, Cryopump, Ion Pumps) Measurement of vacuum - Thermal-conductivity Gauges, Ionization Gauges,

Unit III

Nuclear radiations and detectors

Types of radiations (alpha, beta, gamma), Interaction of charge particles and radiations with matter, Different types of detectors- gas detectors, Scintillation detectors, solid state detectors, Pulse shaping techniques, Elementary ideas on cloud and bubble chambers, and Cerenkov detectors.

Outcomes:

- Able to know the characterization technique for structural and morphological analysis of the samples
- Able to Know and handle the different vacuum pumps and their uses
- Able to know and handle the different types of Radiation detector to study the alpha, beta, gamma

References :

1. Elements of X-ray diffraction, B.D.Cullity
2. X-ray diffraction its theory and application, S. S.K. Chatterjee, PHI Learning Pvt. Ltd
3. Spectroscopy: Fundamentals and Data Interpretation, Neeraj Kumar Fuloria, Shivkanya Fuloria, Studium Press India Pvt. Ltd. (2013), ISBN-13: 978-9380012582
4. Vacuum Technology (Third Edition) *A. Roth*, ISBN: 978-0-444-88010-9
5. Introduction to Nuclear and Subnuclear Physics, H. A. Enge