

## **UNIT 4**

### **MATERIAL CHARACTERIZATION TESTING**

#### **SYLLABUS**

**Macroscopic and microscopic observations, optical and electron microscopy (SEM and TEM) – principles, types, advantages and limitations, applications. Diffraction techniques, electrical and magnetic techniques – principles, types, advantages and limitations, applications.**

#### **4.1 Overview**

- Characterization, when used in materials science, refers to the broad and general process by which a material's structure and properties are probed and measured. It is a fundamental process in the field of materials science, without this no scientific understanding of engineering materials could be determined.
- The Materials Characterization has a wide variety of characterization techniques in the areas of Microscopy, Spectroscopy, and Macroscopic techniques which help to increase the different degrees of understanding why different materials show different properties and behaviour.
- Materials characterizing are aimed at the features of material quantitatively; this is often closely related to the analysis, modelling and simulation, and the qualitative characterization of materials through testing.

#### **Methods of Material Characterization**

- ❖ Chemical Characterization
- ❖ Toxicological Characterization

- ❖ Physical Characterization
- ❖ Electrical Characterization
- ❖ Morphological Characterization
- ❖ Mechanical Characterization

#### **4.1.1 OBJECTIVES OF MATERIALS CHARACTERIZATION**

- ❖ To measure accurately the physical properties of materials
- ❖ To measure accurately the chemical properties of materials
- ❖ To determine accurately the structure of a material at atomic and microscopic level structures

#### **4.1.2 COMMON APPLICATIONS OF MATERIAL CHARACTERIZATION**

- ❖ Surface Chemical Analysis
- ❖ Near Surface Chemical Analysis
- ❖ Atomic & Nano Scale Chemical Analysis
- ❖ Surface Imaging

