

# **Mechanical Properties of Materials**

## **Module I**

Introduction: Intrinsic and extrinsic, structure sensitive and structure insensitive properties. Elastic Behaviour Of Metals, Ceramics. Composites And Elastomers: Stress and strain, atomic model, elastic constants, thermal and alloying effects, anisotropy, analysis of composites, yielding and yield criteria.

## **Module II**

Dislocation In Crystals; Type, properties of dislocation, generation of dislocation, partial dislocation, stacking faults, motion of dislocations (climb, cross-slip), strain hardening and recovery, structure of high, low angle and twin boundaries.

## **Module III**

Modes Of Deformation: Plastic Deformation: Slip planes and directions, shear stress, theoretical shear strength of crystals, strain hardening and recovery, twinning.

Failure Of Materials: Brittle and ductile fracture, creep failure, fatigue, development of creep and fatigue resistant materials, brittle failures in ceramics, glasses and polymers.

## **Module IV**

Strengthening Mechanisms: Cold working and annealing, grain boundary hardening, solute hardening

### **Text Books:**

1. W.Hayden, M.G.Moffatt, The Structure and Properties of Materials, Vol.III, Wiley Eastern L:td. New Delhi.
2. William D.Callister, Materials Science and Engineering: An introduction, Wiley, New York.
3. I.H.Shames, Introduction to Solid Mechanics, Prentice Hall, New Delhi.
4. G.E. Dieter, Mechanical Metallurgy, McGraw Hill, New Delhi.