

Aims:

Introduction to mechanical properties of metals, ceramics and composites

Syllabus:

- Introduction to materials properties Types of materials properties
- Definition of materials properties Why materials properties are important Impact of materials properties on production processes Types of industrial materials
- Mechanical properties of materials Types of stress and strain curve Uniaxial stress test and relevant equipment
- Different mechanical properties of materials elastic plastic behavior of metals Strain Hardening Compression test Bending test Effect of temperature on mechanical properties
- Hardness and its measurement harpy and Izod impact test
- Fatigue and Fatigue failure stages in fatigue failure Reasons for fatigue failure Creep and its curve and creep test
- Materials structure Atomic structure and atomic bonds Crystal structure and its various types Crystalline materials Defects in crystalline materials
- Types of defects in crystalline materials dislocation theory Crystals deformation Slip theory of dislocation Single and poly crystal materials
- Metallic grain formation Recrystallization Metallic grain size and number Isotropic and Anisotropic materials Polymorphism and Amorphous materials
- Metallic alloys & Equilibrium Diagram Different types of metals and metallic alloys Different types of solid solution Equilibrium phase diagram Copper-Nickel Phase diagram
- Ferrous and non-Ferrous Metals Iron Making Steel Making Types of Furnaces Steel production Different types of steel Stainless steel Cast iron Aluminum and Magnesium Copper and Nickel titanium and its alloys Lead and Tin Molybdenum and Tungsten Supper Alloys
- Heat Treatment Definition of heat treatmentAneallingTemperingMartensiteNormalizingHardenabilitySurface Hardening Selective Surface Hardening
- Polymers Definition and polymers structure Types of Polymers Thermoplastics and their properties Thermosets and their properties Elastics and their properties
- Introduction to Ceramics Definition Properties of Ceramics Ceramic products Traditional Ceramics New Ceramics
- Composites Definition Importance and strength and weaknesses Traditional and Synthetic Composites Types of composites Metal Matrix Composites Ceramic Matrix Composites Polymer Matrix Composites

- Reinforcing Phase Continuous and random fibers Materials of Fibers Composite Structure
Application of composite materials

Text Book:

Manufacturing Processes and Technologies, by E. Masehian, PhD.