



Department of Metallurgical and Materials Engineering

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Annexure-3

Syllabus for Written Test and/or Interview for M.Tech. program in Department of Metallurgical and Materials Engineering:

- Basic understanding of Mathematics and logical reasoning.
- Physical Metallurgy: Crystal structure and bonding characteristics of metals, ceramics, alloys and polymers, nano-crystalline and amorphous structures; solid solutions; phase transformation solidification; and binary phase diagrams; principles of heat treatment of steels, surface treatments, recrystallization, recovery, and grain growth; industrially important non-ferrous and ferrous alloys; elements of X-ray and electron diffraction; principles of scanning and transmission electron microscopy; polymers, composites and ceramics; electronic basis of thermal, electrical, optical and magnetic properties of materials; electronic and opto-electronic materials.
- Mechanical Metallurgy: Yield criteria, Elasticity and plasticity; defects in crystals; elements of dislocation theory – types of dislocations, twinning and slip, strengthening mechanisms; fatigue, tensile and creep behaviour; fracture – Griffith theory, super-plasticity; basic concepts of linear elastic and elasto-plastic fracture mechanics, ductile to brittle transition, fracture toughness; failure analysis; Mechanical testing – compression, tension, torsion, hardness, creep, impact, fatigue, fracture formability and toughness.
- Manufacturing Processes: Metal casting, Metal forming, Metal joining; NDT using dye-penetrant, ultrasonic, powder metallurgy; radiography, acoustic emission, eddy current and magnetic particle methods.