

Engineering Materials

Module I

Concept of engineering materials – classification – common features (holistic approach) – emphasis on structure property correlations in all classes of materials – differences in properties and performance - techno economic aspects.

Module II

Introduction to crystallography - Crystal structures of solids, Bravais lattices, unit cells, crystal structures, crystal planes and directions, co-ordination number, single crystals, polycrystalline materials, nano crystalline materials, amorphous materials, packing factor – lattice sites and vacancies – indexing – defects in crystals.

Module III

Mechanical properties of materials: stress and strain, types of stresses, strain, Hooke's law, Poisson's ratio, brittle fracture, ductile fracture, creep, fatigue.

Testing of materials – overview of destructive and non – destructive testing. Mechanical behaviour of materials – concept of deformation – types of failures – predictive methodologies.

Module IV

Concept of phase transformations and some strengthening mechanisms – specific examples and applications of phase transformation and strengthening.

Design and selection of engineering materials – strategies for improvement as well as replacement – some case studies

Text Books:

1. Askeland, DR, 'The Science and Engineering of Materials', 2nd Edition, Chapman and Hall, 1990
2. Callister, Jr WD, 'Materials Science and Engineering – An Introduction', 3rd Edition, John Wiley and Sons Inc., 1994

