

ADVANCED MATERIALS TECHNOLOGY
(Professional Elective - VI)

B.Tech. IV Year II Sem.
Course Code: ME864PE

L T/P/D C
3 0/0/0 3

Pre-Requisites: None

Course Objectives:

- To enlight the students on elastic, plastic and fractured behavior of engineering Materials.
- To train the students in selection of metallic and non-metallic materials for the Various engineering applications.

Course Outcomes: At the end of the course, the student will be able to:

- To select appropriate advanced materials processes for a given product or component recognizing material, size, precision, and surface quality requirements.
- To conduct theoretical and experimental analysis for advanced materials removal and laser processing technologies.

UNIT - I

Introduction to Ferrous Materials: Plain carbon steels, their properties and application: plain carbon steels, effects of alloying elements in plain carbon steels. Alloy steels, tools steels, stainless steels, low and high temperature resisting steels, high strength steels, selections, specifications, form and availability of steel. Cast irons-white, grey, modular malleable and alloy cast irons. Recognised patterns of distribution of graphite flakes in grey cast iron.

UNIT - II

Heat Treatment of Steels: TTT diagrams, annealing, normalizing, hardening, and tempering of steel. Austempering and Martem pering of steel. Surface hardening of steel-Carbonising nitriding carbonitriding cyniding, flues and induction hardeninrg microscopic determination of case depth and depth of hardening.

UNIT - III

Nonferrous materials: Ultra light materials. Properties and application, brasses, bronzes, cupro-nickel alloys, aluminum, magnesium and titanium alloys, bearing materials. Heat treatment of nonferrous materials– soputionizing, Aging and precipitations hardening.

Composites: Polymer – polymer, metal-metal, ceramic –ceramic, ceramic-polymer, metal-ceramic, metal-polymer composites. Dispersion reinforced, particle reinforced, laminated and fiber reinforced composites.

Refractory materials and coatings for high temperature applications. Smart Materials - introduction, types and applications. Thin film shape memory alloys.

UNIT - IV

Biomaterials : Classes and application of materials in medicine and dentistry. Stress strain behaviour of bone. The mechanical properties including elasticity, hardness, viscoelasticity, surface and fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications. The effects of degradation and corrosion.

UNIT - V

Nuclear Materials: Introduction to nuclear materials. Materials for nuclear fuel in fission and fusion reactors, Fissile and fertile materials. Control & Construction Materials for Nuclear reactors, Moderators, Heat Exchangers. Radiation proof materials. Brief discussion of safety and radioactive waste disposal.

TEXT BOOKS:

1. Biomaterials Science- An Introduction to Materials in Medicine /Buddy D. Rattner, A.S. Hoffman, F.J. Sckoen, and J.E.L Emons/ Academic Press
2. Biomaterials: An Introduction /Joon B.Park and Roderic S. Lakes/ Plenum Press

REFERENCE BOOKS:

1. Handbook of Materials for Medical Devices/ J. R. Davis/ ASM
2. Introduction to Nuclear Engineering/ J.R Lamarsh/ Prentice Hall