PMT7J001 MATERIALS FOR ADVANCED APPLICATIONS

Module – I (14 hours)

Introduction: The urge for advancement in materials development and processing, Special and high temperature alloys: Ti alloys: physical and mechanical properties, thermo-mechanical treatment of Ti-alloys, Ti shape memory alloys, Fe based super alloys, Ni based alloys, Co based alloys, engineering applications at elevated temperatures, High Entropy Alloys.

Metallic Foams: Material Definition and Processing, Characterization of cellular metals, Material properties and applications.

Module – II (12 hours)

Carbon and alloy steels: high strength low alloy structural steels, medium-high carbon ferrite-pearlite steels, common alloy steels, Tool steels: classification, composition, structure, properties, heat treatment and uses of different types of tool steels, Special steels: heat resisting steels, Hadfield manganese steels, TRIP steels, maraging steels, dual phase steels.

Module –III (12 hours)

Composite Materials: Material definition and classifications, Advanced polymer composite, Ceramic composite, Metal matrix composite, Nanocomposite, Applications. Coatings and thin films: Definition, Classification of applications, Bio-Materials: Various types of biomaterials, Biopolymer, Bioceramics, Nanostructured bio-materials, Classes of materials used in medicine, Application of materials in medicine and dentistry, Various materials and coatings for implants.

Books for reference:

5. *Engineering Materials – properties and selection by K.G. Budinski and M.K. Budinski, PHI.*
6. *Intermetallic Compounds, Volume 1- 4, by J. H. Westbrook (Editor), R. L. Fleischer (Editor), Wiley.*
7. *Structure-Property Relations in Nonferrous Metals by Alan Russell, Kok Loong Lee, Wiley.*
8. *Physical Metallurgy Principles by R. E. Reed-Hill*
9. *Structure and Properties of Alloys by R. M. Brick, R. B. Gordon and A. Phillips*
10. *Introduction to Materials Science and Engineering by J. F. Shackelford.*
11. *Physical Metallurgy of Steels by W.C.Leslie, McGraw-Hill.*
12. *Introduction to Physical Metallurgy by S.H.Avener, McGraw-Hill.*
13. *Introduction to Material Science and Engineering by Callister, Wiley,Edited by B.D. Ratner, A.S. Hoffman, F.J. Sckoen, and J.E.L Emons, Biomaterials Science,*
14. *An Introduction to Materials in Medicine, Academic Press, Second edition, 2004.*