

### **ME 213 Engineering Materials (3-1-0-8)**

Crystal systems and lattices. Crystallography, crystals and types, miller indices for directions and planes, voids in crystals, packing density in crystals, Crystal imperfections. Characteristics of dislocations, generation of dislocations; Bonds in solids and characteristics of Metallic bonding. Deformation mechanisms and Strengthening mechanisms in structural materials. Principles of solidification: Structural evolution during solidification of metals and alloys. Phase diagrams: Principles, various types of phase diagrams. Iron carbon equilibrium phase diagrams, TTT and CCT diagrams: Pearlitic, martensitic, and bainitic transformations. Various heat treatment processes and hardenability of steels. Hot working and cold working of metals. Recovery, re-crystallization and grain growth phenomenon. General classifications, properties and applications of alloy steels, tool steels, stainless steels, cast irons, copper base alloys, Aluminum base alloys, Nickel base alloys, composites, ceramics and polymers.

#### *Texts:*

- [1] G.E. Dieter, Mechanical Metallurgy, McGraw Hill, 1988.
- [2] W. D. Callister, Material Science and Engineering And Introduction, Wiley, 2002.

#### *References:*

- [1] S.R. Askland and P.P. Phule, The Science And Engineering Of Materials, 4th Ed., Thomson Brooks/Cole, 2003.
- [2] V. Singh, Physical Metallurgy, Standard Publishers, 1999
- [3] W.F. Smith, Principles of Materials Science, McGraw Hill, 1996.
- [4] T.V. Rajan, C.P. Sharma and A. Sharma, Heat Treatments: Principles And Techniques, Prentice Hall, 1997.
- [5] J.F. Shackelford and M.K. Muralidhara, Introduction Of Materials Science for Engineers, Pearson, 6th Ed., 2010.