Year & Sem: E1S1	Course Code: ME1203	Course Name: **Material Science and Metallurgy**	No. of Credits: 4	L	T&PS	P
				2	2	0

UNIT-I: Structure of Metals : Bonds in Solids – Metallic bond - crystallization of metals, grain and grainboundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size, Imperfections in solids like point, line and interfacial defects **Constitution of Alloys :** Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT-II: Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state –allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-Sn and Fe-$Fe_{III}C$.

UNIT-III: Cast Irons and Steels : Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron,Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plaincarbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT-IV: Heat treatment of Alloys : Effect of alloying elements on Fe-FeIIIC system, Annealing, normalizing,Hardening, TTT diagrams, tempering , Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT-V: Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys. **Diffusion mechanisms:** Steady and non-steady state diffusion, factors influencing diffusion, Dislocation and plastic deformation, mechanisms of strengthening in metals, recovery, recrystallizaion and grain growth

UNIT-VI: Ceramic & Composite materials : Crystalline ceramics, glasses, cermaets, abrasive materials, properties and applications of ceramics. Classification of composites, various methods of component manufacture of composites, properties and applications of composites

References/Text Books:

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Essential of Materials science and engineering/ Donald R.Askeland/Thomson.
3. Material Science and Metallurgy/kodgire.
4. Science of Engineering Materials / Agarwal
5. Materials Science and engineering / William and collister.
6. Elements of Material science / V. Rahghavan
7. An introduction to materialscience / W.g.vinas & HL Mancini
8. Material science & material / C.D.Yesudian & harris Samuel
9. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / Jaico Books.

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.