

<b>15CY104</b>	Material Technology	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	1	0	3
	<b>Total Contact Hours - 45</b>				
	<b>Prerequisite</b>				
	<b>Nil</b>				
<b>PURPOSE</b>					
This course provides the basic concepts of chemistry of materials required for engineering applications.					
<b>INSTRUCTIONAL OBJECTIVES</b>					
To enable the students					
1.	To gain <b>knowledge on the nature of materials, its properties, and the use of materials in engineering.</b>				
2.	To acquire an understanding about metallurgy and phase equilibria.				
3.	To understand <b>the important aspects of the chemistry of ferrous metal and non ferrous metals.</b>				
4.	To gain knowledge on some <b>selected composites, adhesives, FRPs and their applications</b> interdependence.				
5.	To gain an understanding of the properties, manufacture and the applications of building materials.				

### UNIT I - NATURE OF MATERIALS

**9 hours**

Selection process of engineering materials (General aspects) - Chemical and physical properties of materials - chemical structure: Micro and macro structure -corrosion resistance - chemical reactivity. Mechanical properties - stress, strain, strength, hardness, malleability, ductility-elasticity-plasticity-toughness, thermal stability. (General Aspects)

Types of deformation: Plastic, viscous; plastic deformation of single crystal, poly crystalline metals: slip, twinning, dislocations - visco elasticity - creep in metals, amorphous materials.

### UNIT II - METALLURGY

**9hours**

Extractive Metallurgy: Hydro, pyro and electro metallurgy - refining of metals. Powder Metallurgy: methods of production of metal powder - Mixing of metal powders - compaction of powders - applications.

Extraction process of Iron: manufacture of pig iron - blast furnace operations - chemistry of reactions. Manufacture of cast iron - varieties of cast iron - effect of impurities. Production of steel - Bessemer process - open-hearth process - L D methods. Classification of steel - effect of impurities.

Heat treatment process: annealing, hardening, tempering, normalizing and gas carburizing.

Fe- Carbon phase diagram.

### UNIT III - NON - FERROUS METALS, ALLOYS

**9hours**

Extraction of Copper, Nickel, Lead - methods involved - properties and applications. Alloys of Cu, Ni and Pb - brasses- bronzes-nickel with Cu, Zn, Cr, Fe, Mo - super alloys. Lead alloys - Pb with Sb, Sn. - applications.

### UNIT IV - COMPOSITES AND ADHESIVES

**9hours**

Polymer composites - introduction - Types of composites - particle reinforced - fiber reinforced - structural composites - examples. Matrix materials, reinforcement materials- Kevlar, Polyamides, fibers, glass, carbon fibers, ceramics and metals . Techniques for producing FRP - applications.

### UNIT V - BUILDING MATERIALS

**9 hours**

Cement-types-portland cement-manufacture-properties-uses-environmental effects

Refractories: properties of refractories - acidic, basic and neutral - manufacture of refractories - common refractory bricks - insulating refractories.

Ceramics: Classification - fabrication methods of clay, silicon carbide, alumina, silicon nitride - Properties of important engineering ceramics - applications.

Abrasives: classification - applications.

### **Text book**

- Khanna O.P., *A Text book of Material science and Metallurgy*, Danpat Rai Publications, 1999.
- Rajput R.K., *A Text book of Material Science and Engineering*, S.K Kataria & sons, Delhi, 2003

### **REFERENCES**

- Dara S.S., *A text book of Engineering Chemistry*, S.Chand and company Ltd., 2003 .
- Agarwal C.V., *Chemistry of Engineering materials*, Tata McCraws Hill, 1997
- William F.Smith, *Foundation of Materials Science and Engineering*, Tata McCraw Hill, 1998

**15CY104 – MATERIAL TECHNOLOGY**

Course designed by		Department of Chemistry										
1	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x		x	x	x			x		x	x
2	Mapping of instructional objective with student outcome	1		3	4	1			5		5	2
3	Category	General (G)			Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)	
					x							
4	Broad area (for 'P' category)	Structural Engineering			Geotechnical Engineering			Water Resources Engineering			Geomatics Engineering	
5	Course Coordinator											
6	Assessment	In case the assessment method is different from the general method stipulated in the regulations, then the same shall be specified here.										
7	Approval	xx <sup>th</sup> meeting a academic council held on dd/mm/yyyy										