4031 – MECHANICAL ENGINEERING MATERIALS

Teaching Schedule Per Week			Progressive Assessment	Examination Schedule (Marks)			
Lectures	Practical	Credits		Theory		Practical Ex.	Total
4	-	4	25	3 Hrs	100	-	125

Pre-requisite	Source
Nil	MEC

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	–	–	100

RATIONALE:- This course is introduced with a view to supplement knowledge as far as properties, uses and application of materials to a mechanical engineering are concerned. This information will be useful in studying other subjects of Mechanical Engineering. This will enable students to make comparative study of materials while selecting the appropriate material for manufacturing of various machine components.

COURSE CONTENTS	Hrs	Mks
1. INTRODUCTION TO ENGINEERING MATERIALS	5	7
Types of materials – metals, Polymers, Ceramics, composites, Selection criteria, Identification of metals, Forms of commonly used Engineering materials, Definition of basic mechanical properties like Strength, durability, elasticity, plasticity, toughness, Malleability, brittleness, hardness, stiffness, fatigue.		
2. METALS	20	36
.Ferrous metals, Pig iron, Cast iron, Grey C I, White Cast iron its properties uses, Malleable Cast iron its properties and uses, Chilled Cast iron, its properties and uses, S.G Cast iron its properties and uses, Alloy Cast iron its properties & Uses wrought iron its manufacturing process and uses, Steels, Definition, Effect of carbon percentage on structure of steel, Effect of residual elements on steel, Classification of steel on the basis of carbon, content ,(low, medium & high carbon steels) their composition, Properties and uses., Alloy steels, Purpose of alloying , effect of alloying , elements on steels, different alloy steels like ' free cutting steel, Structural steel, ball bearing steel, Spring steel, H.S.S., stainless steel, magnet steel, shock resisting steel. Non ferrous metals & its alloys, Aluminium and its alloys, Copper and its alloys, Lead and its alloys, Tin and its alloys, Bearing metals, alloys for high temperature service, Metal for nuclear energy, Identification of materials based on following codes ISI, AISI, Selection of materials for specific applications		
3. HEAT TREATMENT OF STEEL	10	14
Introduction, Iron carbon equilibrium diagram, Objects of heat treatment process, Factor in heat treatment process, Purpose, application, procedure of various heat treatment processes like Annealing, normalising, hardening, Tempering, Case hardening, T.T.T. Curve or S curve.		
4. GLASS ABRASIVES & REFRACTORS	9	14
Definition of glass, Forming constituents of glass, Structure of glass, Types of glass like soda glass, high silica glass, borosilicate glass, fibre glass, and flint glass, Classification & Uses of abrasives. Introduction to refractories Properties of refractories, Refractory materials, Refractory products		
5. PLASTIC, RUBBER & HEAT INSULATING MATERIALS	10	14
Plastic – Definition, Classification, Compounding materials, properties, Thermosetting resins – various types such as phenolics (Bakelite), urea and melamine, formal dehyde, Epoxy resins, Thermoplastic resins – various type such as PVC, Teflon (flurocarbon) polythylene, Polypropylene, Nylon, Rubber Definition, Classification, characteristics, Natural Rubber - its drawbacks, Synthetic rubber its		

important properties various types such as Neoprene rubber, Nitrile rubber, Butyl rubber, Styrene butadiene rubber, Silicon rubber, Vulcanisation of rubber. Heat insulating materials properties of various common materials such as asbestos, glass-wool, cork, Thermocole	10	14
6. NON – DESTRUCTIVE TESTING Visual inspection, Dye – penetrant test – principle, procedure, Advantages and disadvantages, Magnetic partrile test principle procedure, Advantages and disadvantages. Radiographic Test principle, Procedure advantages and disadvantages, X ray radiography, r-ray radiography, Penetrameters, Safety precautions		
Total	64	100

REFERENCE BOOKS:

1. Material science and process – by S.K. Hajra Choudhary , Indian book distributors.
2. Materials and Metallurgy – by H.S. Bawa, T.m.H. Publications.
3. Metal Hand Book, Vol. I & II – American society of Engineers.
4. Materials and processes – by james F. young.
5. The nature and properties of Engg. Materials (S.I. Version) by Jastrzebski.