Lesson Plan

Discipline: Mechanical
Semester: 4th Mechanical
Subject: Materials and Metallurgy
Lesson Plan Duration: 15 weeks
Work Load (Lecture/ Practical) per week (in hours): Lecturers- 04, Practicals- 02

Week	Theory		Practical	
	Lecture day	Topic (including assignment / test)	Practical Day	Topic
1st	1st	Material, Engineering materials.	1st	Classification of about 25 specimens of materials/ machine parts into i) Metals and non metals
	2nd	History of material origin, Scope of Material Science.		
	3rd	Overview of different engineering materials and applications	2nd	ii) Metals and alloys
	4th	Importance, Classification of materials, Difference b/w metals and non- metals.		
2nd	1st	Physical and mechanical properties of various materials.	1st	iii) Ferrous and non ferrous metals
	2nd	Present and future needs of materials.		
	3rd	Various issues of Material Usage- Economical, Environment and Social.	2nd	iv) Ferrous and non ferrous alloys.
	4th	Overview of Biomaterials and Semiconducting materials.		
3rd	1st	Fundamentals: Crystalline solid and amorphous solid.	1st	Given a set of specimen of metals and alloys; identify and indicate the various properties possessed by them.
	2nd	Unit cell, space lattice, Arrangement of atoms in simple cubic crystals, BCC, FCC and HCP Crystals.		
	3rd	No. of atoms per unit cell, Atomic packing factor, coordination number.	2nd	Given a set of specimen of metals and alloys; identify and indicate the various properties possessed by them.
	4th	Defects/ Imperfections, types and effects in solid materials.		

4th	1st	Deformation: overview of deformation behavior and its mechanisms.	1st	a) Study of heat treatment furnace.
	2nd	Elastic and plastic deformation		
	3rd	Behaviour of material under load and stress- strain curve.	2nd	a) Study of heat treatment furnace.
	4th	Failure Mechanisms: overview of failure modes, fracture, fatigue and creep.		
5th	1st	Metallurgy: Introduction , cooling curves of pure metals, dendritic solidification of metals.	1st	b) Study of a thermocouple/ pyrometer
	2nd	Effect of grain size o mechanical properties		
	3rd	Binary alloys, Thermal equilibrium diagrams.	2nd	c) Study of a thermocouple/ pyrometer
	4th	Lever rule, solid solution alloys.		
6th	1st	Ferrous Metals: Different iron ores	1st	Study of a metallurgical microscope and a specimen polishing machine.
	2nd	flow diagram for production of iron and steel.		
	3rd	Allotropic forms of iron- alpha, delta, gamma.	2nd	Study of a metallurgical microscope and a specimen polishing machine.
	4th	Basic process of manufacturing of pig iron and steel- making.		
7th	1st	Cast Iron: Properties, types of cast Iron	1st	To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials. i) Brass ii) copper iii) Cast Iron iv) Mild Steel v)HSS vi) Aluminum
	2nd	Manufacture and their use.		
	3rd	Steels: Plain carbon steels and alloy steel.	2nd	To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials. i) Brass ii) copper
	4th	Classification of plain carbon steels,		

				iii) Cast Iron iv) Mild Steel v)HSS vi) Aluminum
8th	1st	Properties of different types of plain carbon steels.	1st	To anneal a given specimen and find out difference in hardness as a result of annealing.
	2nd	Application of different types of plain carbon steels.		
	3rd	Effect of various alloying elements on properties of steel.	2nd	To anneal a given specimen and find out difference in hardness as a result of annealing.
	4th	Uses of alloy steels.		
9th	1st	Non ferrous Materials: Properties	1st	To normalize a given specimen and to find out the difference in hardness as a result of normalizing.
	2nd	Uses of copper		
	3rd	Aluminum and their alloys.	2nd	To normalize a given specimen and to find out the difference in hardness as a result of normalizing.
	4th	Definition and objectives of heat treatment.		
10th	1st	Iron carbon equilibrium diagram	1st	To harden and temper a specimen and to find out the difference in hardness due to tempering.
	2nd	Different microstructures of iron and steel.		
	3rd	Formation and decomposition of Austenite	2nd	To harden and temper a specimen and to find out the difference in hardness due to tempering.
	4th	Martensitic Transformation.		
11th	1st	Various heat treatment processes- hardening.		
	2nd	Tempering, Annealing, normalizing.		
	3rd	Surface hardening, carburizing.		
	4th	Nitriding, cyaniding. Hardenability of Steels.		
12th	1st	Types of heat treatment furnaces.		
	2nd	Measurement of temperature of furnaces.		
	3rd	Important of plastics, Classification- Thermoplastic and thermoset.		
	4th	Plastic and their uses.		

13th	1st	Various trade names of plastics, plastic coatings, food grade plastics.		
	2nd	Applications of plastics in automobile and domestic use.		
	3rd	Rubber classification- Natural and synthetic. Selection of rubber.		
	4th	Heat Insulating materials- Asbestos, glasswool, thermocole.		
14th	1st	Ceramics- Classification, Properties, applications.		
	2nd	Refractory materials- Dolomite, porcelain.		
	3rd	Glass- Soda lime, borosil.		
	4th	Joining materials/ Adhesives- Classification, Properties and applications.		
15th	1st	Abrasive materials. Composites- Classification, properties, applications.		
	2nd	Materials for bearing metals.		
	3rd	Materials for Nuclear Energy.		
	4th	Smart materials- properties and applications.		