

Government Polytechnic Mandkola, Palwal

Lesson Plan

Name of Faculty : Sh. Ravindra Kumar (Theory / Practical)
Discipline : Mechanical Engineering
Semester : 4th
Subject : Materials and Metallurgy
Lesson Plan Duration : 15 weeks (from March 2023 to June 2023)

Work Load (Lectures / Practical) per week (in hours): Lectures-03, Practicals-02

WEEK	THEORY		PRACTICAL	
	Lecture Day	Topic (Including Assignment / Test)	Practical Day	Topic
1 st	1 st	1.Introduction <ul style="list-style-type: none"> • Material • History of material origin 	1 st	1.Classification of about 25 specimens of materials/machine parts into <ul style="list-style-type: none"> • Metals and non metals • Metals and alloys • Ferrous and non ferrous metals • Ferrous and non ferrous alloys
	2 nd	<ul style="list-style-type: none"> • Scope of material science 		
	3 rd	<ul style="list-style-type: none"> • Overview of different engineering materials and applications • 		
2 nd	4 th	<ul style="list-style-type: none"> • Classification of material • Present and future needs of materials 	2 nd	do
			3 rd	do
	5 th	<ul style="list-style-type: none"> • Thermal • Chemical • Electrical • Mechanical Properties of Various material	4 th	Do

	6 th	Overview of biomaterials and semiconducting materials		
3 rd	7 th	Various issues of material usage Economical, Environment and social	5 th	2. Given a set of specimen of metals and alloys (copper, brass, aluminum, cast iron, HSS, gun metal); identify and indicate the various properties possessed by them
	8 th	2. Crystallography <ul style="list-style-type: none"> Fundamentals: Crystal, unit cell, space lattice 		
	9 th	Arrangement of atoms in <ul style="list-style-type: none"> Simple cubic crystals, BCC crystals 		
4 th	10 th	<ul style="list-style-type: none"> FCC crystals HCP crystals 	6 th	do
	11 th	Number of atoms per unit cell Atomic packing factor	7 th	do
	12 th	Deformation <ul style="list-style-type: none"> Overview of deformation behavior and Mechanisms 	8 th	do
5 th	13 th	<ul style="list-style-type: none"> Behavior of material under load and stress strain curve. 	9 th	3. Study of heat treatment furnace.
	14 th	Failure mechanism: Overview of failure modes, fracture, fatigue and creep	10 th	do
	15 th	3. Metallurgy Introduction, Cooling curves of pure metals, dendritic solidification of metals,		
6 th	16 th	effect of grain size on mechanical properties, Binary alloys,	11 th	do
	17 th	Thermal equilibrium diagrams, Lever rule	12 th	do
	18 th	Solid Solution alloys		
7 th	19 th	4. Metals and Alloys Introduction: History and development of iron and steel	13 th	4. Study of a metallurgical microscope and a specimen polishing machine.
	20 th	Different iron ores		
	21 st	Raw material in production of iron and steel Basic process of making <ul style="list-style-type: none"> Iron making 	14 th	do

		Steel making		
8 th	22 nd	Classification of iron and steel	15 th	do
	23 rd	Cast iron Different types of cast iron	16 th	do
	24 th	Manufacturing and their Usage		
9 th	25 th	Steels : Steels and alloy steel Classification of plain carbon steels. <ul style="list-style-type: none"> • Availability Properties and Usage of different types of plain carbon steels	17 th	5. To prepare specimens of following materials for microscopic examination and to examine the microstructure of the following materials: i) Brass ii) Cu iii) Grey iv) Malleable v) LCS vi) HCS vii) HSS
	26 th	Effects of various alloys on properties of steel Uses of alloys steels <ul style="list-style-type: none"> • High speed steel • Stainless steel • Spring steel Silicon steel	18 th	
	27 th	Non ferrous materials		
	28 th	Properties and uses of <ul style="list-style-type: none"> • Light metals and their alloys 	19 th	do
10 th	29 th	And uses of white metals and their alloys 5. Heat treatment Purpose of heat treatment,		
	30 th	Solid solutions and its types		
			20 th	do
11 th	31 st	Iron carbon diagram: formation and decomposition of Austenite, Martensitic Transformation- Simplified transformation <ul style="list-style-type: none"> • Cooling curves 	21 st	6. To anneal a given specimen and find out difference in hardness as a result of annealing
	32 nd	Various heat treatment process <ul style="list-style-type: none"> • Hardening 		

	33 rd	<ul style="list-style-type: none"> Tempering Annealing Normalizing 	22 nd	do
12 th	34 th	Case hardening and surface hardening	23 rd	do
	35 th	carburizing, nitriding,		
	36 th	cyaniding. Hardenability of Steels	24 th	7. To normalize a given specimen and to find out the difference in hardness as a result of normalizing
13 th	37 th	Types of heat treatment furnaces required for above operations (Only basic idea)	25 th	do
	38 th	6. Plastics Important sources of plastics	26 th	do
	39 th	Classification - thermoplastic and thermoset and their uses		
14 th	40 th	Various names of engineering Plastics coating, Rubber classification - Natural and synthetic. Selection of rubber	27 th	8. To harden and temper a specimen and to find out the difference in hardness due to tempering
	41 st	7. Advanced Materials Composites Classification, properties and application	28 th	do
	42 nd	Ceramics <ul style="list-style-type: none"> Classification, properties and application Heat insulating Materials		
15 th	43 rd	<ul style="list-style-type: none"> Heat insulating materials for bearing metals. Refractory materials – Dolomite, porcelain.	29 th	do
	44 th	Joining materials/Adhesives – Classification, properties and applications Abrasive materials	30 th	do
	45 th	Glass – Soda lime, borosil. Materials for Nuclear Energy Smart materials- properties and applications.		

