MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

			LESSON						
			Department of	-	r				
Name of the Subject Material Science				Name of t handling I	Ms V SI	Ms. V.Shobana			
Subject		PH8251		Year / Ser	n I Year / I	I Year / II Sem			
Acad Ye	ear	2020-2021	Course Ob	Batch					
To intro	duce the e	essesntial principles of materials science for me			g applications.				
At the e	nd of the a	course, the students will able to,	Course Ou	tcome					
		on the various phase diagrams and their applic	ations						
		cognize on Fe - Fe ₃ C phase diagram, various m		llovs					
	<u>^</u>	n mechanical properties of materials and their		ino js.					
		duce on magnetic, dieelctricand superconducti		erials					
	-	e basics of ceramics, composites and nanomat		criais.					
05-1	stillate til	e basies of cerainies, composites and national	Lesson P	lan					
			T / R*		Mode of Teaching				
Sl. No.		Topic(s)	Book	Periods Required	(BB / PPT / NPTEI / MOOC / etc)	Blooms Level (L1-L6)	со	РО	
UNIT	I - PHA	SE DIAGRAMS			/ 10000 / Ed.)				
1		utions, Hume Rothery's rules	T1 / R1	1	BB	L1	CO1	PO1,PO4	
2	the Phase	e rule	T1 / R4	1	BB	L2	CO1	PO1,PO	
3	single component system of iron		T1 / R1	1	BB	L2	CO1	PO4	
4	Binary phase diagrams		T1 / R4	1	BB	L3	CO1	PO4	
5	isomorphous systems		T1 / R1	1	BB	L3	CO1	PO4	
6	eutectic phase diagram		T1 / R1	1	BB	L3	CO1	PO4	
7	peritectic phase diagram		T1 / R4	1	BB	L3	CO1	PO4	
8	free ener	gy composition curves for binary systems	T1 / R4	1	BB	L2	CO1	PO9	
9	Microstr	uctural change during cooling	T1 / R1	1	BB	L2	CO1	PO9	
		ty: Assignment / Case Studies / Tuorials/ Q	uiz / Mini Project	s / Model De	veloped/others Plar	ned if any			
Assignn Evaluat	nent tion meth	od							
	out of 10								
UNIT	II - FEI	RROUS ALLOYS		-		1			
10	Iron Cart	oon Equilibrium diagram	T2 / R4	1	РРТ	L2	CO2	PO1,PO	
11	Microstr	ucture of hypoeutectoid steel	T2 / R4	1	BB	L3	CO2	PO1,PO	
12	Microstructure of Hypereutectoid steel		T2 / R4	1	BB	L3	CO2	PO1,PO	
13	effect of alloying elements on the Fe-C system		T2 / R4	1	BB	L3	CO2	PO9	
14	diffusion of solids -Fick's law		T2 / R4	1	BB	L2	CO2	PO9	
15	phase tra	nsformations	T1 / R4	1	РРТ	L2	CO2	PO9	
16	T-T-T- d	iagram fro eutectoid steel	T1 / R4	1	PPT	L2	CO2	PO4	
	pearlitic, baintic and martenslitic transformations		T1 / R4	1	PPT	L3	CO2	PO4, PO12	
17								PO4,	

	ion method ut of 10						
UNIT	III - MECHANICAL PROPERTIES						
19	Tensile test, plastic deformation mechanisms	T2 / R4	1	РРТ	L2	CO3	PO4
20	strengthening methods, refinement of the grain size	T2 / R4	1	PPT	L2	CO3	PO1, PO4
21	solid solution strengthening	T2 / R4	1	BB	L2	CO3	PO9
22	hardening, precipitation, martensite, dispersion	T2 / R4	1	BB	L3	CO3	PO9
23	creep resistance, curves, mechanisms of creep	T1 / R4	1	BB	L3	CO3	PO4
24	fracture, griffth criterion	T1 / R4	1	BB	L2	CO3	PO4
25	fatigue test, methods of increase fatigue life	T1 / R4	1	BB	L2	CO3	PO4
26	Rockwell and Brinell hardness	T2 / R4	1	PPT	L3	CO3	PO9
27	Knoop and Vickers microhardness	T2 / R4	1	BB	L3	CO3	PO9, PO12
Suggest Assignn	ed Activity: Assignment / Case Studies / Tuorials/ Q	uiz / Mini Projects	/ Model De	veloped/others Plann	ned if any		
Evaluat	ion method						
	ut of 10						
28	IV - MAGNETIC, DIELECTRIC AND SUP Ferromagnetism: Origin and exchange interaction,	T1 / R4		BB	L1	CO4	PO4
28 29	saturation magnetization and curie temperature	T1 / R4		BB	L1 L3		PO4 PO4
	Domain theory of Ferromagnetism	T1 / R4	1	BB	L3 L3	CO4	
30	Hysteresis of M Vs H behavior		1	BB	L3 L2	CO4	PO4
31	Dielectric materials, polarisation process	T1 / R4	1			CO4	PO4
32	internal field, Clausius -Mosotti relation	T1 / R4	1	BB	L3	CO4	PO9
33	dielectric breakdown, dielectric loss, dieletric strength	T1 / R4	1	BB	L3	CO4	PO4
34	Superconducting materials	T2 / R4	1	BB	L2	CO4	PO9
35	Properties	T2 / R4	1	PPT	L2	CO4	PO9
36	problems	T1 / R4	1 (Madal Da	BB	L3	CO4	PO2
Assignn	ed Activity: Assignment / Case Studies / Tuorials/ Q nent	uiz / Withi Projects	/ Widdel De	veloped/others Plann	ied if any		
	ion method ut of 10						
UNIT	V - NEW MATERIALS						
37	Ceramics- tyoes and applications	T3 / R3	1	PPT	L2	CO5	PO4
38	composites: classification, rolo of matrix and reinforcement	T3 / R3	1	РРТ	L2	CO5	PO9
39	processing of fiber reinforced plastics	T3 / R3	1	PPT	L3	CO5	PO9
40	Metallic glasses: types	T3 / R3	1	PPT	L2	CO5	PO4
41	melt spining process, applications	T3 / R3	1	PPT	L3	CO5	PO9
42	shape memory alloys, shape memory effect, pseudoelastic effect	T3 / R3	1	PPT	L3	CO5	PO4
43	NiTi alloy, applications	T1 / R4	1	PPT	L3	CO5	PO9
44	Nanomaterials preparation, properties and applications	T1 / R4	1	PPT	L3	CO5	PO9
45	carbon nanotubes and its types	T1 / R4	1	РРТ	L3	CO5	PO9
Suggest Quiz	ed Activity: Assignment / Case Studies / Tuorials/ Q	uiz / Mini Projects	/ Model De	veloped/others Plann	ned if any		<u> </u>
	ion method						
	ut of 10 t Beyond the Syllabus Planned						
1	COMPARISON OF DIA, PARA AND FERRO MAGN	ETISM					

2	BCS THE	EORY, COO	OPER PAIF	R										
	•						Text Bool	śs						
1	Balasubramaniam.R, "Callister's Materials Science and Engineering", Wiley India Pvt. Ltd., 2014													
2	Raghavan.V. " Physical Metallurgy: Principles and Practice", PHI Learning, 2015													
3	Raghavan.V. " Materials Science and Engineering: A First course", PHI Learning, 2015													
	•					Re	ference B	ooks						
1	Askeland.D " Materials Science and Engineering " Brooks/Cole, 2010.													
2	Smith,W.F., Hashemi,J.Prakash,R," Materials Science and Engineering". Tata McGraw Hill Education Pvt.Ltd.,2014 Wahab, M.A. —Solid State Physics: Structure and Properties of Materials. Narosa Publishing House, 2009.													
3	-				•			arosa Publi	ishing Hou	se, 2009.				
4	Senthil K	umar G. " N	Material Sci	ence", VR	B Publicatio									
	Website / URL References shape memory alloys: https://www.youtube.com/watch?v=M4lDuktUael													
1	shape memory alloys: https://www.youtube.com/watch?v=M4IDuktUaei metallic glasses: types:https://www.youtube.com/watch?v=OULkYytYPgs, https://www.youtube.com/watch?v=AZ3tQioo1DU													
2 3														
4	pulsed laser deposition: https://www.youtube.com/watch?v=JL8qvTW-WCg Carbon Nanotube - https://youtu.be/aVvgEMhOYfo													
5	-				www.youtu		watch?v=	A3vh84er	n04					
5	magneti		23 01 301103	11(1)(3.77	www.youtt		looms Le		40-					
Level 1	(L1): I	Remembe	ring		Ŧ			L4) : Ana	lysing					
Level 2	2 (L2) : U	nderstand	ling		Lower Order	Fixed Hour		L5) : Eva	• •				Higher Order	Projects / Mini
	6 (L3) : A		8		Thinking	Exams		L6) : Cre					Thinking	Projects
	(15) • 11								0					
	•• ••	Ma			with Bloo	m's Tax L1	ONOMY I	LOT and	L4	L5	L6	LOT	НОТ	Total
-	it No			Name										
	nit 1	PHASE D	DIAGRAMS	5		1	4	4	0	0	0	9	0	9
Unit 2 FERROUS ALLOYS			0	4	5	0	0	0	9	0	9			
Unit 3 MECHANICAL PROPERTIES			0	4	5	0	0	0	9	0	9			
Unit 4 MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS			1	3	5	0	0	0	9	0	9			
U	nit 5	NEW MA	TERIALS			0	3	6	0	0	0	9	0	9
		Т	otal			2	18	25	0	0	0	45	0	45
		Total P	ercenta	ge		4.44	40.00	55.56	0.00	0.00	0.00	100.00	0.00	100.00
) PO Mapj	_						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	3	-	-	-	-	3	-	-	1	-	-
CO2	3	-	-	3	-	-	-	-	3	-	-	1	-	-
CO3	3	-	2	3	1	-	-	-	3	-	-	1	-	-
CO4	3	1	1	-	1	-	1	-	-	-	-	1	-	-
CO5	3	1	1	-	1	-	1	-	-	-	-	1	-	-
		1	2	3	1	-	-	-	3	-	-	1	-	-
Avg	3				I	ustificatio	n for CO-l	PO mappir	ng					
Avg	3				0									
	Applying	-	-	-	strongly (PO)	l). This wi	-	-	-					
Avg CO1	Applying (PO3). Th	nis will help	in conduc	t investigat	trongly (PO)	l). This wi blex proble	ems to some	e extent (PC	04). (PO9)					
	Applying (PO3). Th engienerii	nis will help ng field we	o in conduct akly and (P	t investigat O12) recog	strongly (PO)	l). This wi blex proble ed for life-	ems to some long learnin	e extent (PC	D4). (PO9) extent.	gives the k	nowledge	of indivual	and team v	vork in
	Applying (PO3). Th engienerii	nis will help ng field we	o in conduct akly and (P	t investigat O12) recog	strongly (PO) tions of comp gnizes the new	l). This wi blex proble ed for life-	ems to some long learnin	e extent (PC	D4). (PO9) extent.	gives the k	nowledge	of indivual	and team v	vork in
CO1	Applying (PO3). Th engienerin Applying	nis will help ng field wea the concep	o in conduct akly and (P ts of ferrous	t investigat O12) recog s alloys str	trongly (PO) ions of comp gnizes the ner ongly (PO1).	l). This wi blex proble ed for life- This will	ems to some long learnin help in con	e extent (PC ng to some duct invest	D4). (PO9) extent. igations of	gives the k	nowledge o	of indivual	and team v nt (PO4). (F	vork in
CO1	Applying (PO3). Thengienerin Applying the knowl	his will help ng field we the concep ledge of ind	o in conduct akly and (P ts of ferrous livual and to	t investigat O12) recog s alloys str eam work i	strongly (PO) tions of comp gnizes the new	l). This wi olex proble <u>ed for life-</u> This will g field wea	ems to some long learnin help in con akly and (P	e extent (PC ng to some duct invest O12) recog	D4). (PO9) extent. igations of	gives the k complex p	nowledge of roblems to	of indivual	and team v nt (PO4). (F	vork in PO9) gives
CO1	Applying (PO3). Thengienerin Applying the knowl Concepts solutions	his will help ng field wes the concep ledge of ind of various	b in conduct akly and (P ts of ferrous livual and te mechanical x engineerin	t investigat O12) recog s alloys str eam work i properties ng problem	trongly (PO) ions of comp gnizes the ne- ongly (PO1). in engienerin of the mater as (PO3). Thi	1). This wi olex proble ed for life- This will g field we ials to stro is will help	ms to some long learnin help in con akly and (P ng Enginee o in conduc	e extent (PC ng to some duct invest O12) recog ring knowl t investigat	D4). (PO9) extent. igations of mizes the r ledge (PO1 ions of cor	gives the k complex p need for life). This will nplex probl	nowledge of roblems to -long learn help in de ems to son	some exter ing to som sign and de te extent (F	and team v nt (PO4). (F e extent. evelopment PO4). Devel	PO9) gives of loping
CO1 CO2	Applying (PO3). Th engienerin Applying the knowl Concepts solutions simple mo	his will help ng field wes the concep ledge of ind of various for comple: odel helps t	b in conduct akly and (P ts of ferrous livual and te mechanical x engineerin o learn the	t investigat O12) recog s alloys str eam work i properties ng problem techniques	trongly (PO) ions of comp gnizes the ner ongly (PO1). in engienerin of the mater is (PO3). Thi (PO5) weak	1). This wi olex proble ed for life- This will g field we ials to stro is will help	ms to some long learnin help in con akly and (P ng Enginee o in conduc	e extent (PC ng to some duct invest O12) recog ring knowl t investigat	D4). (PO9) extent. igations of mizes the r ledge (PO1 ions of cor	gives the k complex p need for life). This will nplex probl	nowledge of roblems to -long learn help in de ems to son	some exter ing to som sign and de te extent (F	and team v nt (PO4). (F e extent. evelopment PO4). Devel	of loping
CO1 CO2	Applying (PO3). Th engienerii Applying the knowl Concepts solutions simple more recognize Concepts	his will help ng field weat the concept ledge of ind of various in for complex odel helps t s the need for of various in	b in conduct akly and (P ts of ferrous livual and to mechanical x engineerin o learn the for life-long magnetic m	eam work i properties ng problem techniques g learning v aterials, di	trongly (PO) ions of comp gnizes the ner ongly (PO1). in engienerin of the mater as (PO3). Thi (PO5) weak veakly. electric mate	 This wi This wi the problemation of the problematic structure the problematic struc	ems to some long learnin help in con akly and (P ng Enginee o in conduc helps to und rconducting	e extent (PC ng to some duct invest O12) recog ring knowl t investigat derstand the g materials	D4). (PO9) extent. igations of mizes the r ledge (PO1 ions of cor e impact of and its bre	gives the k complex p need for life). This will nplex probl i individual akdown att	nowledge of roblems to -long learn help in de ems to son and team	some exter some exter sign and de ne extent (F work to sor rong Engin	and team v nt (PO4). (F e extent. evelopment PO4). Deve ne extent an eering kno	of loping nd PO12 wledge
CO1 CO2	Applying (PO3). Th engienerii Applying the knowl Concepts solutions simple me recognize Concepts (PO1). Th	his will help ng field weat the concept ledge of ind of various in for complex odel helps t s the need for of various in s will help	b in conduct akly and (P ts of ferrous livual and to mechanical x engineerin o learn the for life-long magnetic m	t investigat O12) recog s alloys str eam work i properties ng problen techniques t learning v aterials, di n solving (1	trongly (PO) ions of comp gnizes the ner ongly (PO1). in engienerin of the mater is (PO3). Thi (PO5) weak weakly.	 This wi This wi the problem of the problem	ems to some long learnin help in con akly and (P ng Enginee o in conduc helps to und rconducting and develo	e extent (PC ng to some duct invest O12) recog ring knowl t investigat derstand the g materials pment of so	D4). (PO9) extent. igations of enizes the r edge (PO1 ions of cor e impact of and its bre bolution (PC	gives the k complex p need for life). This will nplex probl individual akdown att 03) to a grea	nowledge of the second	some exter some exter sign and de ne extent (F work to sor rong Engin Developin	and team v nt (PO4). (F e extent. evelopment PO4). Deve ne extent an eering kno g simple m	vork in PO9) gives of loping nd PO12 wledge odel helps

CO5	Understand the basics of quantum structures and their applications and carbon electronics attributes to strong Engineering knowledge (PO1). This will help in problem solving (PO2) as well as design and development of solution (PO3) to a greater extent. Selecting suitable algorithm helps in learning the commercial software (PO5) to some extent. PO7 gives the knowledge of engineering solutions in society and environment moderately. PO12 recognizes the need for life-long learning to some extent.									
	3	High level	gh level 2 Moderate level		1	Low level				
Name & Sign of Faculty Incharge :										
Name & Sign of Subject Expert :										
Head o	f the Depa	rtment :								

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