UGIE, Rourkela Session: 2025-26 Lesson Plan			
Discipline: **Metallurgical Engineering**	Semester: 3rd	Name of the Teaching Faculty**: Tanmaya kumar mallick**	
Subject: **PHYSICAL METALLURGY(TH-04)**	No. of days/per week class allotted:**4**	Semester from Date: **22. 12. 2025** to Date: **18.04.2026** No. of weeks: 14	
Week	**Class No.**		**Lecture Topics**
1	1	Chapter -1: Introduction to physical metallurguy	Classification of materials
	2		Structure of metals: Atomic bonding, metallic bonding.
	3		Imperfections in Solids: Point defects
	4		Vacancies,interstitials
2	5		substitutional defects
	6		Line defects: Edge and screw dislocations
	7		Surface defects: Grain boundaries
	8		Twin boundaries and volume defects
3	9	Chapter -2: Solid Solutions & Solidification of pure metals & alloys	Definition of alloys and solid solutions.
	10		Solidification & crystallisation
	11		Role of free energy/ thermodynamic potential in conversion of liquid to solid.
	12		Super cooling, under cooling & degree of super cooling
4	13		Mechanism of solidification
	14		Nucleation, critical size of nucleous.
	15		Spontaneous(Homogeneous & Heterogeneous nucleation) Relation between rate of nucleation and crystal growth.
	16		Ingot structure & shape of crystals.
5	17	Chapter-3: Types of electrochemical cells	Introduction to equilibrium diagram, definition & difference from phase diagram/importance of phase diagram.
	18		Drawing of equilibrium diagram of binary systems
	19		Types of Equilibrium diagram.

	20		Explanation of isomorphous type of equilibrium diagram with example.
6	21		Peritectic & peritectoid type of equilibrium diagrams.
	22		Phase rule & lever Rule. Application of phase rule & lever rule.
	23	Chapter-4:Phase Diagrams & Phase Transformations	Introduction to Fe-Fe3c phase diagram.
	24		Drawing of Fe-Fe3c phase diagram.
			Practice of drawing Fe-Fe3c phase diagram.
7	25		Different phases, microconstituent of Fe-Fe3c system.
	26		Role of carbon in iron to differentiate steel & cast iron.
	27		Application of Lever rule to Fe-Fe3c system.
	28		Difference between Fe-Fe3c & Fe-c diagram.
8	29	Alloys and Their Properties	Ferrous Alloys
	30		Plain Carbon Steels
	31		properties and applications
	32		Alloy Steels
9	33		Effects of alloying elements (Ni, Cr, Mo, V, W, Mn, Si)
	34		Applications, stainless and special steels
	35		Cast Irons: Types of cast irons
	36		Their microstructure, properties, and applications.
10	37		Non-Ferrous Alloys
	38		Aluminium Alloys
	39		Copper Alloys
	40		Other Non-Ferrous Alloys
	41		titanium alloys, nickel alloys
	42		Superalloys, shape memory alloys
	43		properties and applications
	44		Revision Class
	45		Important question discussion

Prepared By
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