

GOVERNMENT POLYTECHNIC JAIPUR

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DEPARTMENT OF METALLURGICAL ENGG.

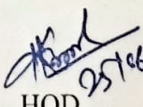
Discipline: Metallurgy	Semester: 3rd	Name of the Teaching faculty: Rakesh Kumar Sahu
Subject: TH4- MTK	No of Days/Week class allotted: 3	Semester from Date: 01/07/26 To Date: 05/11/26 No of weeks: 15
Week	Class Day	Topics
1st	1 st	Unit-I : Basic Concepts of Thermodynamics Introduction: Definition of thermodynamics, Metallurgical thermodynamics
	2 nd	System, surroundings, types of systems (open, closed, isolated)
	3 rd	Thermodynamic properties -intensive, extensive, state functions
2nd	1 st	Zeroth Law of Thermodynamics: Concept of thermal equilibrium, temperature measurement
	2 nd	First Law of Thermodynamics: Conservation of energy , Internal energy
	3 rd	heat capacity, specific heat(Cp & Cv)
3rd	1 st	Enthalpy, Enthalpy Change due to chemical reaction
	2 nd	Heat and work, Numerical problems
	3 rd	Isothermal, adiabatic, isobaric, isochoric
4th	1 st	Doubt clearing class of Unit-1, Numerical practice
	2 nd	Class Test-1
	3 rd	Unit-II : Entropy: Concept of entropy, Entropy of a Substance
5th	1 st	Entropy change in reversible and irreversible processes
	2 nd	Second Law Statements: Different statements of the second law
	3 rd	Gibbs free energy: Definition of Gibbs free energy, derivation
6th	1 st	Significance of Gibbs free energy in determining spontaneity of reactions
	2 nd	Relationship between Gibbs free energy and equilibrium constant
	3 rd	Helmholtz free energy (ΔA)
7th	1 st	Maxwell relations
	2 nd	Unit-III : Phase Equilibria & Metallurgical Applications
	3 rd	Solutions & Phase Rule : Ideal & non- ideal solutions,
8th	1 st	Raoult's Law, Henry's Law
	2 nd	Gibbs' phase rule, Basic Numerical practices
	3 rd	Unary & binary phase diagrams
9th	1 st	Concept of Ellingham diagrams & Applications
	2 nd	Oxide stability & reduction reactions
	3 rd	Predominance Area Diagram
10th	1 st	Remedial Class on Unit-2 & 3
	2 nd	Class Test-2
	3 rd	Unit-IV : Chemical Kinetics & Reaction Rate Theory

11th	1 st	Fundamentals of Reaction Kinetics: Rate of reaction
	2 nd	Order & Molecularity
	3 rd	Activation energy
12th	1 st	Arrhenius equation
	2 nd	Homogeneous vs. Heterogeneous reactions
	3 rd	Electrochemical Thermodynamics: Electrochemical cells
13th	1 st	Nernst equation, Numerical based on EC Cell & Nernst equation
	2 nd	Doubt clearing class of Unit-4, Important Q & A discussion
	3 rd	Unit-V : Application of Thermodynamics in Extraction & Refining
14th	1 st	Basics of Ironmaking & Steelmaking thermodynamics
	2 nd	Roasting, Smelting, Refining processes
	3 rd	Basic Concept of fugacity, activity
15th	1 st	Equilibrium constant & Numerical practices
	2 nd	Previous years Semester question & answer discussion
	3 rd	Very Similar Test(VST) to Semester questions

Course Outcomes(COs): After completing this course, the student should be able to:

1. Demonstrate an understanding of thermodynamic laws and their relevance to metallurgical systems.
2. Interpret and apply phase diagrams, Ellingham diagrams, and Gibbs free energy concepts in metal processing.
3. Analyze chemical reaction kinetics and phase transformation mechanisms in metallurgical operations.
4. Apply electrochemical principles to understand corrosion behavior and prevention techniques.
5. Utilize thermodynamic and kinetic principles for optimizing metallurgical and materials engineering processes.

Rakesh Ku. Samu
Dt- 25/6/26
Course Co-ordinator
Metallurgical Engg.


HOD 25/6/26
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