

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR	
Department of metallurgical engineering	
Lesson plan	
Course- Physical metallurgy	Session-Jan-June 2025
Course instructor-Abhinandan kumar	Semester-4
TOPIC	NO.OF PERIODS (HOURS)
UNIT-1 Fundamentals of Physical Metallurgy	18
Crystal structure	1
Point defects(vacancy,interstitial,Frenkel,Schottky)	2
Line defects(Edge and Screw dislocation)	3
Surface defects(Free surface, tilt and twist boundary ,twin and stacking faults)	4
Volume defects	1
Principles of X- Ray diffraction and Braggs law& determination of crystal structure	4
Scanning and Electron Microscope	3
UNIT-2 Solidification	15
Concepts of solidification	2
Nucleation(Homogenous & Heterogeneous)	3
Smooth or stable interface growth	2
Temperature inversion, Dendritic growth	4
Freezing of ingots & Segregation	4
UNIT-3 Deformation of metals	15
Mechanical properties of metals	3
Slip system & critical resolved shear stress	2
Types of Twins and difference between slip & twinning	3
Recovery, polygonisation	3
Recrystallisation	4
UNIT-4 Strengthening mechanism	15
Concept of strengthening, Grain boundary strengthening	4
Hall petch equation	2
Yield point phenomenon, Luder-band formation	3
Solid solution strengthening, strain ageing, Strain hardening	5
UNIT-5	15
Types of fracture, Ductile & Brittle fracture	3
Theoretical cohesive strength	2
Griffith theory of brittle fracture ,	3
Crack velocity in brittle materials, Initiation & propagation of crack in Brittle materials	4
Fracture Toughness, Prevention of fractures	3

Abhinandan Kumar

Department

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR

Department of Metallurgical Engineering

LESSON PLAN

Course - Corrosion Engineering

Session: Jan - Jun 2025

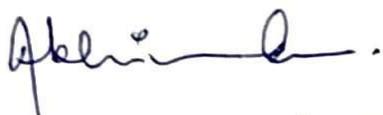
Course Instructor - Abhinandan Kumar

Semester - 4

TOPIC	NO. OF PERIODS (HOURS)
UNIT -1 Introduction of Corrosion	12
Introduction and importance of corrosion	01
Processes leading to degradation of metals	01
Oxidation	02
Wear, Creep and fatigue	01
Classification of corrosion	01
Chemical and electrochemical corrosion	01
Wet and dry corrosion	01
Environmental aspects of corrosion	02
Corrosion as useful process	01
Economic and technical significance of corrosion	01
UNIT-2 Electrochemistry of Corrosion	12
Principles of electrochemistry	02
Electrochemical cells	01
EMF and Galvanic series	02
Nernst's equation	01
Factors affecting corrosion	01
Potential - pH diagram	01
Polarization and their types	02
Mixed Potential theory	01
Passivity	01
UNIT-3 General forms of Corrosion	12
Introduction to general forms of corrosion	01
Uniform corrosion	01
Galvanic corrosion	02
Mechanism, factors and prevention of galvanic corrosion	01
Crevice corrosion	01
Mechanism, factors and prevention of crevice corrosion	02
Pitting corrosion	01
Mechanism, factors and prevention of pitting corrosion	03
UNIT-4 Specific forms of Corrosion	12
Introduction to specific forms of corrosion	01
Selective leaching	01
Dezincification and graphitization	01

Stress corrosion	01
Corrosion fatigue	01
Erosion corrosion	01
Hydrogen embrittlement	01
Intergranular corrosion	01
Weld decay and knife line attack	01
Microbial corrosion	01
Concentration cell corrosion	01
Underground or soil corrosion	01
UNIT-5 Corrosion prevention and control	10
Introduction to corrosion prevention and control	01
Corrosion prevention methods	01
Cathodic protection	01
Anodic protection	01
Application of inhibitors	01
Corrosion control methods	01
Corrosion control by proper designing	01
Metallic and non-metallic coatings	02
Corrosion prevention and control in various field applications	01

No. of Periods (Hours): 58
No. of Periods (Hours) actually taken:


 ABHINAV KUMAR


 Head of Department
 Department of Metallurgical Engineering
 Govt. Co-Ed Polytechnic Jagdalpur

LESSION PLAN
Subject – Iron Production
Semester - 4th

S.No.	No. Of Periods	Topic Name	Remarks
	(Approx.Hrs: CI = 12)	Unit 1. Introduction and burden preparation 1.1History of iron making- 1.11 Globaland Indian scenario of iron and steel production 1.1.2 Quality ,occurrence and characteristics- Iron ore, Fluxes, Fuels(Raw Materials) 1.2 Metallurgical coke 1.2.1 Function and importance. 1.3 Agglomeration of iron ore- 1.3.1 Sintering- 1.3.1.1Principle 1.3.1.2 Working 1.3.1.3 Mechanism 1.3.1.4 Uses and application 1.3.2 Pelletization1.3.1.1Principle 1.3.1.2 Working and types of palletizing machine 1.3.1.3 Mechanism 1.3.1.4 Uses and application	
	(CI-12)		
	(Approx. Hrs: CI = 12)	Unit 2.Blast Furnace construction and operation 2.1Constructional features- 2.1.1 Blast furnace plant layout 2.1.2Crosssection, Design criteria, Cooling system 2.1.3Refractories 2.1.4Charging Mechanism 2.1.5 Blast furnace stove 2.1.6 Gas cleaning system2.1.6.1 Dust Catchers 2.1.6.2 Gas scrubber 2.1.6.3 Electro static precipitator 2.2Thermodynamics of blast furnace processes- 2.2.1 Physico-chemical principles of blast furnace. 2.2.2 Blast furnace reactions in various zone 2.2.3 Blast furnace slag and slag metal reactions. 2.3 External treatment of hot metal(Desulphurization and Desiliconisation) 2.4 Irregularities in blast furnace-	

	(Approx. Hrs: CI = 09)	Unit 3. Modern developments in Blast furnace Operation. 3.1 Injection of Auxiliary fuel(CDI,PCI) 3.2 Oxygen enrichment 3.3 High top pressure 3.4 Burden preparation 3.5 Increased blast temperature 3.6Modification in charging system. 3.7 Factors affecting blast furnace productivity. 3.8 Environmental aspects of iron making. 3.9 Utilization of Blast furnace byproducts (gas, slag).	
	(CI = 09)		
	(Approx. Hrs: CI = 07)	Unit 4.Alternative Iron Making Processes: 4.1 list of alternative processes for iron production 4.2 Need of alternative Iron making processes 4.21 Comparison of conventional and alternatives routes for iron making 4.3 Direct reduced iron (Sponge iron) 4.31 Introduction, Uses, limitation of DRI process. 4.32Raw Materials 4.33Industries in C.G & India producing sponge iron. 4.4Environmental impact of various alternative Iron making techniques.	
	(CI = 07)		
	(Approx. Hrs: CI = 10)	Unit 5. DRI and Smelting reduction Processes 5.1Coal Based DRI 5.11Thermodynamics and kinetics. 5.12 Principle and operations 5.13 list the name of some coal based DRI Processes 5.13 SL/RN process-working principle.	

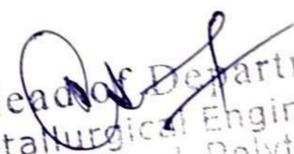
	5.21 Thermodynamics and kinetics. 5.22 Principle and operations. 5.23 list the name of some coal based DRI Processes 5.24 Midrex-working principle 5.3 Smelting reduction Technology for hot metal production with examples 5.31 COREX- working principle 5.4 Use of DRI & HBI in Iron & Steel making.	
(CI- 10)		

Number of periods planned : 50



Subject Teacher : - Pushpendra Kumar Alsare

(Name and Signature)



Head of Department
 Metallurgical Engineering
 Govt. Co-ed. Polytechnic
 Bistar, JAGDALPUR (C.G.)

LESSION PLAN

Subject – Non Ferrous Extractive emtallurgy
Semester - 4th

S.No.	No. Of Periods	Topic Name	Remarks
	(Approx.Hrs: CI = 10)	Unit 1.0 Extraction of Aluminium 1.1 Important ores of Aluminium 1.2 Raw materials for Aluminium production 1.3Extraction of Aluminium 1.3.1 Production of Alumina 1.3.2 Bayer's process, 1.3.3 Factors affecting Bayers process 1.3 Production of aluminium 1.4 Hall Heroult process. 1.5 Refining of Aluminum. 1.6 Electrolytic Refining 1.7 Newer process for aluminium production 1.7.1 ALCOA process 1.7.2 ALCAN process	
	(CI-10)		
	(Approx. Hrs: CI = 13)	Unit2.0 Extraction of Copper 2.1Important ores of copper 2.2Raw materials for copper production 2.3Extraction of copper 2.3.1 Roasting of Copper 2.3.2Smelting of Copper in Reverberatry furnaces, 2.3.3 Converting 2.4 Refining of copper 2.4.1 fire refining 2.4.2 electrolytic refining 2.5 Newer process for copper production 2.5.1 Flash smelting 2.5.2 Continuous copper production –WORCRA process 2.6 Hydrometallurgy of copper	
	(CI = 13)		
	(Approx. Hrs: CI = 13)	Unit 3Extraction of lead and Zinc 3.1Important ores of lead and zinc 3.2Raw materials for lead and zinc Production 3.3Extraction of lead 3.3.1 Roasting and sintering of lead ore 3.3.2 smelting of lead ore-lead blast furnace 3.4 Refining of lead 3.4.1 Parke's process 3.4.2 Electrolytic refining 3.5 Modern developments in lead smelting 3.6 Extraction of zinc	

		3.6.1.1 Horizontal retort reduction 3.6.1.2 Vertical retort reduction 3.6.2 Hydrometallurgical Extraction of zinc 3.7 Imperial Smelting process	
	(CI = 13)		
	(Approx. Hrs: CI = 8)	Unit 4.0 Extraction of Tin and Nickel 4.1 Important ores of tin and nickel 4.2 Raw materials for tin and nickel production 4.3 Extraction of Tin 4.3.1 concentration of tin ore 4.3.2 smelting of tin concentrate in reverberatory furnace 4.3.3 pyrometallurgical refining of tin 4.4 Extraction of nickel 4.4.1 concentration of nickel ore 4.4.2 smelting of nickel concentrate 4.5 nickel refining by carbonyl process	
	(CI = 8)		
	(Approx. Hrs: CI = 06)	Unit 5 Extraction of magnesium and titanium 5.1 Important ores of magnesium and titanium 5.2 Raw materials for magnesium and titanium production 5.3 Extraction of magnesium 5.3.1 Methods of magnesium extraction 5.3.2 Pidgeon process 5.4 Extraction of titanium 5.4.1 concentration of titanium ore 5.4.2 Kroll's process	
	(CI- 06)		

Number of periods planned : 50

Subject Teacher : - Pushendra Kumar 

(Name and Signature)


Head of Department
Department of Metallurgical Engineering
Govt. Co-Ed Polytechnic Jagdalpur

GOVT.CO-ED POLYTECHNIC,JAGDALPUR

METALLURGY DEPARTMENT

SUBJECT - FUNDAMENTALS OF MECHANICAL METALLURGY

LESSION PLAN

Subject Teacher- Mr. Pushendra Alsare

SEM - 4TH

SESSION - APRIL - MAY 2025

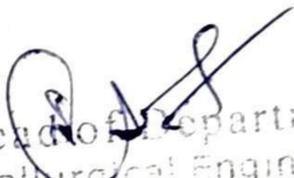
S.NO	No.of Periods	TOPIC
	16	CHAPTER - 01 (Metal working and deformation theories)
	1	Introduction
	1	Pre-requisite knowledge
	1	Theory of stress and strain
	1	Engineering stress and engineering strain
	1	True stress and true strain
	1	Relation between true stress and true strain
	1	Stress strain diagram for mild steel, cast iron, Al, Cu
	1	Deformation theories
	1	Types of Deformation
	1	Effect of strain rate and temperature on deformation.
	1	Effect of mechanical working on properties of metal.
	1	Strain hardening
	1	Cold working
	1	Annealing after cold working
	1	Hot working
	1	Differences between cold working and hot working
	10	CHAPTER-02(Rolling of Metals)
	1	Introduction
	1	Classification of rolled products
	1	Rolling practice adopted for different products.
	1	Rolling mills.
	1	Principle and theories of rolling.
	1	Zone of deformation, Angle of bite, Neutral Angle
	1	Forward and Backward slip in rolling,
	1	Effect of rolling load and power required,
	1	Rate of deformation in rolling.
	1	Rolling defects and their remedies.
	8	CHAPTER-03(Forging Process)
	1	Introduction
	1	Classification of forging process.
	1	Open and closed die forging.
	1	Forging operations:- Edging, fullering ,drawing, swaging, piercing and punching.
	1	Forging Equipments
	1	Forging hammers and presses.
	1	Forging Dies.
	1	Forging Defects and their remedies.
	8	CHAPTER-04(Extrusion Process)
	1	Introduction
	1	Principle and equipments used.

	1	Variables used in extrusion.
	1	Dies and material used.
	1	Classification of extrusion process.
	1	Direct, indirect and Impact extrusion.
	1	Extrusion of different products like tube, seamless pipes etc.
	1	Extrusion defects and remedies.
	8	CHAPTER-05(Wire Drawing and Sheet Metal Forming Prozesse)
	1	Process and equipments used in wire drawing.
	1	Drawing of wire, rod, tubes.
	1	Die selection in wire drawing process.
	1	Lubricants used in wire drawing process.
	1	Wire drawing defects & remedies.
	1	Sheet metal forming
	1	Bending, stretch, blanking, shearing, deep drawing and redrawing process.
	1	Defects in formed products.

No of classes planned : 50

No of classes actually taken:




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 Bastar, JAGDALPUR (C.G.)