

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR**Department of Metallurgical Engineering****LESSON PLAN**

Course - Entrepreneurship Development and Management	Session: Nov-Dec 2025
Course Instructor – Pushpendra kumar Alsare	Semester - 5

TOPIC	NO. OF PERIODS (HOURS)
UNIT -1 Characteristics of entrepreneurs	09
Concept of entrepreneur and intrapreneur	01
Benefits of becoming an intrapreneur/ entrepreneur	01
Scope of entrepreneurship in local and global market	01
Planning for establishment of an enterprise	01
Traits of successful intrapreneur/ entrepreneur, passion, initiative, independent decision making, team work, assertiveness, persuasion, persistence, information seeking, commitment to work contract etc. SW analysis. Team work, simulation.	03
Trait of successful entrepreneur: calculated risk taking. Risk taking simulation exercise.	01
Business opportunity Guidance	01
UNIT-2 Motivation Management	07
Motives, motivation and motivational cycle.	01
Concept of need for achievement.	01
need for Achievement assessment through various tools	01
Ring toss game & Boat making exercise	01
Building block exercise & TAT stories & Who am I	02
Interpretation and action plan for self development	01
UNIT-3 Management of Creativity.	06
Creativity: Divergent thinking, creativity techniques.	01
Innovation, types and applications	01
Product life cycle, New product development process.	02
Product development and innovation through creativity and innovation.	02
UNIT-4 Critical Resources	16
Proprietorship, Partnership, Cooperative, Private,	01
Public Ltd Company, Section 8 company, LLP	01
Institutional Support for entrepreneurship: MSMESI, CED, DTIC, CITCON, CSIDC,	03
LUN, NSIC, KVIC, NABARD, Banks, SIDBI	02
Entrepreneurship promotion schemes of centre and state	01
Marketing Mix, Market survey for project identification	02
Inventory control, vendor development, material movement, store management.	03
Manpower plan, hiring process, compensation, performance appraisal	03
UNIT-5 Sustainable business plan	10
Format of business plan/techno-economic feasibility report	01
Demand and annual production target based on market survey.	02
Outline production/service process.	01

Land, building and machinery requirement	01
Power, utilities and raw material requirement	01
Fixed capital, Working capital, Subsidy and Cost of Project.	02
Means of finance, calculation of interest.	01
Profitability analysis, Break- even point	01

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

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Heat Treatment – Lesson Plan

Unit No	Unit Title	Topics / Subtopics (detailed)	Lecture Hours (Planned)	Lecture Hours (Delivered)
1.0	Heat Treatment Principles	1.1 Introduction, principle and importance of heat treatment. 1.2 Mechanism of formation of austenite and pearlite. 1.3 Isothermal transformation of austenite. 1.4 Time–Temperature–Transformation (TTT) diagram — importance, plotting, types, critical cooling rate, factors, effect of alloying elements. 1.5 Continuous Cooling Transformation (CCT) diagram. 1.6 Transformations: pearlitic, bainitic and martensitic — morphology & characteristics.	10	
2.0	Heat Treatment Processes	2.1 Principles, objectives, methods and applications of different heat treatment processes. 2.2 Annealing – 2.2.1 Full annealing, 2.2.2 Homogenising annealing, 2.2.3 Recrystallisation annealing, 2.2.4 Stress relief annealing, 2.2.5 Spheroidisation annealing, 2.2.6 Diffusion annealing, 2.2.7 Partial annealing, 2.2.8 Isothermal annealing. 2.3 Normalising – purpose, microstructural changes, advantages. 2.4 Special heat treatment processes – 2.4.1 Austempering, 2.4.2 Martempering, 2.4.3 Patenting; explain purpose, process, temperature ranges and resulting microstructures.	10	
3.0	Hardening and Tempering Processes	3.1 Hardening – 3.1.1 Principles and objectives, 3.1.2 Process of quenching, 3.1.3 Different quenching media, 3.1.4 Quenching methods, 3.1.5 Retained austenite, 3.1.6 Defects in hardening. 3.2 Tempering – 3.2.1 Importance, 3.2.2 Stages of tempering, 3.2.3 Temper embrittlement. 3.3 Hardenability – 3.3.1 Significance, 3.3.2 Critical and ideal critical diameter, 3.3.3 Jominy end quench test, 3.3.4 Factors affecting hardenability.	10	

4.0	Surface Hardening Methods	4.1 Importance and objective of Surface Hardening 4.2 Types of surface hardening methods 4.2.1 Thermo-chemical methods 4.2.2 Thermal methods 4.3 Principle, Procedure and Application of following Thermo-chemical methods 4.3.1 Carburizing 4.3.2 Nitriding 4.3.3 Carbo-nitriding 4.3.4 Cyaniding 4.4 Principle, Procedure and Application of following Thermal methods 4.4.1 Flame hardening 4.4.2 Induction hardening 4.4.3 Laser hardening	10	
5.0	Heat treatment of Non Ferrous Metals and Alloys	5.1 Importance of heat treatment 5.2 Heat treatment of aluminium alloys 5.3 Heat treatment of copper alloys 5.4 Age-hardening 5.4.1 Importance and objective 5.4.2 Age-hardening of Al-Cu system 5.4.3 Steps of Age-hardening treatment 5.4.4 Types of precipitates 5.4.5 Hardening Mechanisms	8	

Number of periods planned :

Subject Teacher : - Gaurav Verma

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GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR	
Department of metallurgical engineering	
Lesson plan	
Course- Metal joining & safety engineering	Session-July-Dec 2025
Course instructor- Gourav Verma	Semester-5
TOPIC	NO.OF PERIODS (HOURS)
UNIT-1 Introduction to metal joining process	12
Importance & purpose of joining process	1
Classification of joining process	2
Soldering, filler materials & flux	2
Soldering advantages, applications & limitations	1
Brazing , filler metal & flux	1
Brazing advantages, applications & limitations	2
Welding , Classification of welding processes, Safety aspects in metal joining processes	2
Welding advantages, applications & limitations	1
UNIT-2 Fusion Welding Process	12
Different types of Welding processes	3
Gas welding Processes	3
Arc welding Process	2
MIG & TIG welding	2
Submerged arc welding & Plasma arc welding	2
UNIT-3 Resistance, Solid state and Thermo- chemical welding process	12
Resistance welding	2
Spot welding, advantage , limitation & applications	2
Explosive & Friction welding	2
advantage , limitations & applications	2
Thermit welding, advantages, limitations & applications	4
UNIT-4 Modern welding processes and welding metallurgy	12
Electron Beam Welding, advantages ,limitations & applications	3
Laser Beam Welding, advantages ,limitations & applications	3
Solidification of weld metal, Different zones in weld metal	4
Welding defects , causes and their remedies	2
UNIT-5 Introduction to Safety Engineering	10
Classification of accidents	2
Causes of accidents	2
Loss due to accidents, Fire Hazards	3
Safety rules for different metallurgical shops	3

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR	
Department of Metallurgical Engineering	
LESSON PLAN	
Course – Steel Production	Session: Nov Dec 2025
Course Instructor – Abhinandan Kumar	Semester - 5

TOPIC	NO. OF PERIODS (HOURS)
UNIT -1 Introduction of primary steel production	09
Global and Indian scenario of steel production	01
Brief history of developments of steel production	01
Raw materials used in steel production - Occurrence of Raw material in India	01
Flow of Detailed layout of steel production plant	01
Historical steel production process - Bessemer process,	01
Open hearth process	01
Modified open hearth steel making	01
Classify various steel production processes	01
Integrated Vs mini steel plant	01
UNIT-2 Principles of Steel production	05
Basic Principles of Steel Production	01
Thermodynamics and kinetics of steel production.	01
Metallurgy of removal of C, Mn, Si, S, P.	01
Removal and Impact of gases impurities	01
Steel furnace slags- Definition & types	01
UNIT-3 Basic Oxygen furnace (BOF) Steel Making	06
Principle of oxygen steel making	01
Production of Steel by Linz and Donawitz (L.D.) Process- constructional details, Refractory lining of L.D. vessel	01
Design of oxygen lance, Charge materials in L.D. process & sequence of charging	01
Characteristics of L.D. process, Steps involved procedure	01
Modified L.D. converter process-Kaldo & Rotor process	01
Merits and limitations of BOF steel making	01
UNIT-4 Steel Production in Electric Arc Furnace and Casting	11
Electric Arc Furnace-Construction of EAF, Melting practice	01
Operational details, Use of DRI in arc furnace	01
its effect on performance & Advantages	01
Casting - Ingot casting, Solidification of Ingots	01
ingot structure	01
Types of steel-killed, semi-killed & rimmed steel	01
Continuous Casting of Steel - Principle, Type of Continuous casting machine	01
Details of equipments and mold cooling arrangement.	01

Advantages in continuous casting processes.	
Tundish Metallurgy	01
Ingot defects – Ingot cracks, piping, segregation, Surface defects, blowholes, and non – metallic inclusions	01
UNIT-5 Secondary steel making	10
Secondary Steel Making - Need of secondary process of steel making	01
Non metallic inclusion(NMI), its types, sources & control	01
Degassing in steel Seiverts law, Degassing, deoxidation, desulpherisation, dephosphorisation	01
General techniques of vacuum degassing	01
Dortmund Hoerder (DH), Rheinstahl Heinrich (RH), RHOB(Oxygen Blowing) processes	01
ladle refining furnace - Ladle Stirring and its Advantages	01
Ladle metallurgy & injection technology	01
Stainless steel production-Classification of Stainless steel	01
Vacuum Oxygen Decarburization (VOD),	01
Argon-Oxygen Decarburization(AOD) and other proces	01

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

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GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR	
Department of Metallurgical Engineering	
LESSON PLAN	
Course – Material testing	Session: july-dec 2025
Course Instructor – Beniram sahu	Semester - 5

TOPIC	NO. OF PERIODS (HOURS)
UNIT -1 Mechanical Properties of Metals	20
Importance of mechanical testing,	01
Classification of various types of testing method, Principles and types of mechanical testing, selection of testing methods, calibration method and standard, material testing and interpretation	03
Different mechanical properties of metals such as – Ductility, Brittleness, Malleability, Stiffness, Resilience, Hardness & Toughness.	04
Tensile Test	
Tensile properties of metals, Machine used for tensile test, Types of Tensile Testing	01
Percentage elongation, Percentage reduction in Area, Yield and Ultimate tensile strength, Benefits of Tensile testing,	02
Standard tensile test specimen, other accessories for the test,	01
Major parts, functions and application of Universal Testing Machine (UTM)	01
Application of tensile test	01
compression test- Principle and procedure of Compression Test, Types of Compression Testing, Benefits of Compression Testing,	03
Materials Under Compression. Applications of Compression Testing	01
Torsion testing- Principle and procedure of Compression Test, Types of Torsion -Compression Testing	02
Benefits of Torsion Testing, Torsion Failure Modes Effects of specimen geometry and testing variables.	01
UNIT-2 Hardness Test	12
Definition and Moh's scale of Hardness,	03
Brinell Hardness test – Principle, Machine used, Penetrators & loads used, Precautions and limitations of the test,	03
Rockwell Hardness Test – Principle, Machine used, Penetrators, loads and scales used, Procedure, Precautions, merits and demerits of the test, Rockwell superficial Hardness Test, Application of Rockwell hardness test	03
Vickers Hardness Test – Principle, Machine used, Procedure, precautions and limitations of the test, Application of Vickers hardness test	03
UNIT-3 Impact Test	14
Izod and Charpy test, Machine used for the test,	03
Standard specimen for the tests,	02
Principle, Importance, Procedure,	03
Precautions of the above tests,	01

Comparision between Izod and Charpy tests,	01
Effect of variables on the impact test values,(striking velocity, size and shape of the specimen, temperature, grain size, composition of the metal, cold work etc.),	03
Embrittlement phenomena-Temper Embrittlement.	01
UNIT-4 Fatigue Test	08
Principle, procedure,	02
Precautions and importance of the fatigue test,endurance limit	02
Stress-Number of cycles (S-N) Curve,	02
Factors affecting fatigue strength. Application of the fatigue test	02
Creep Test	08
Principle, procedure,	02
Precautions and importance of the creep test,	02
Creep curve, Creep testing Machine,	02
Factors affecting creep strength. Application of the Creep test	02
UNIT-5 Non-Destructive Tests	15
Introduction and scope of non-destructive testing and evaluation,Principle, procedure and precautions of the above tests. Dye penetrant,Magnetic, Radiographic,Acoustic & Ultrasonic methods of non-destructive testing, Eddy current methods Principle and procedure of Eddy current method, Techniques of Eddy current method,Merits and demerits	14
Advantages of non-destructive testing.	01

No. of Periods (Hours): 80
No. of Periods (Hours) actually taken:

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