

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR	
Department of Metallurgical Engineering	
LESSON PLAN	
Course - Computer Aided Metallurgical Analysis & Quality Control	Session: Apr - May 2026
Course Instructor – Pushendra Kumar Alsare	Semester - 6

TOPIC	NO. OF PERIODS (HOURS)
UNIT -1 Overview of Hardware & Software used for Metallurgical Analysis	10
Introduction	01
Hardware for metallurgical analysis	01
Computer system	01
Computerized microscope with image analyzer	02
Probes and sensors used for metallography	01
Software for metallurgical analysis	01
Software for image capture and analysis	01
Open source softwares like matlab, Scilab, Jmatpro, etc	02
UNIT-2 Metallurgical Analysis Methods	12
Introduction and importance of metallurgical analysis	01
Classification of analysis	01
Qualitative analysis method	01
Spot and Spark testing method	01
Quantitative analysis method	01
Volumetric analysis	01
Gravimetric analysis	01
Chemical analysis of metals and non-metals	01
Analysis of metallic ores of Fe, Al, Cu.	01
Analysis of sponge iron	01
Analysis of iron and steel for C, Si, Mn, S & P - Strohlein apparatus & Eggertz method	02
UNIT-3 Computer Aided Metallurgical Analysis	14
Introduction	01
Microstructure examination	01
Grain size measurement	01
Phase analysis and percentage phase measurement	01
Nodule counting	01
Inclusion rating	01
Case depth and coating measurement methods	01
Instrumental methods	01
Introduction to Spectroscopy	01
Emission spectroscopy	01
X-ray diffraction	02
Electron microscopy - Scanning and transmission electron microscope	02
UNIT-4 Quality Control and Inspection	10
Introduction of quality control	01

Aim of quality control in iron and steel industries	01
Quality inspection stages	01
Quality control stages	01
Quality assurance stages	01
Process approach	01
Importance and benefits of process approach	01
Overview of standardization and standard operating procedure (SOP)	01
Overview of quality circle	01
Quality improvement programme in metallurgical industries	01
UNIT-5 Quality Economics and TQM	12
Introduction to quality economics	01
Cost and value of quality	01
Cost of quality appraisal	01
Exterior and interior failure cost	01
Total quality management	01
Six Sigma	01
Methodology of six sigma	01
Overview of Kaizen and 5S	01
ISO 9000 family - quality management	01
ISO quality management	01
Overview of ISO 9000, 9001 & 9004	01
Overview of ISO 14000 and ISO 14001	01

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

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

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR
Department of Metallurgical Engineering

Course –ferrous and non-ferrous metal and alloy
Sem -6th

Session: may-june 2026

Unit-1 Introduction to ferrous and non-ferrous alloy.(10)

s.no.	Topic to be covered	No.of periods(hours)
1	Introduction to ferrous metal/alloy & non-ferrous metals/alloy	02
2	Various alloying element and their characteristics	02
3	Effect of alloying element to fulfill specific field requirement.	01
4	Importance of alloys Classification of metal alloy	02
5	Properties and their industrial applications of ferrous alloys	01
6	Properties and their industrial applications of non-ferrous metals	01
7	Examples of alloys used in industries	01

UNIT II- Ferrous Alloy – Cast Iron and Steel(15)

1	Different types of cast irons, composition properties , uses and making process	02
2	Grey cast iron, White cast iron	02
3	Malleable cast iron ,Nodular cast iron	02
4	Chilled cast iron ,Alloy cast iron	01
5	Wrought iron –Composition properties, uses and making process.	02
6	Different types of steels	02
7	Classification of plain carbon steel and alloy steel , their properties, composition and uses,	02
8	Advantages of alloy steels over plain carbon steels	01
9	Alloy steel their properties, composition and uses	01

Unit –III Special Alloy Steels(13)

1	Composition, properties and applications of :High speed steels	02
2	Stainless steels	01
3	Heat resisting steels	01
4	Free cutting steels, Spring steels	02
5	High strength low alloy steel, Tool steels	02
6	Hadfield steels, Dual phase steels	02
7	Ferro Alloy Manufacturing process and its uses with Examples Ferro silicon, Ferro manganese, Ferro chrome.	03

Unit IV-Non-Ferrous Alloys(10)

1	Advantages of Non-ferrous alloys over ferrous alloys	01
2	Copper and its alloys: Binary equilibrium diagram of Cu-Zn, Cu- Sn , Composition, properties, uses and microstructure	02
3	Aluminium and its alloys: Binary equilibrium diagram of Al-Si, Al –Cu, Composition, properties uses and Microstructure.	02
4	Composition properties ,uses and Their phase diagram- Duralumin and Y alloys	02
5	Compositions, properties and applications-Magnesium, Tin	01
6	Lead, Titanium	01
7	Zinc, Nickel	01

Unit V- Copper alloys and some important alloys(17)

1	Manufacturing of Copper alloy, Aluminium alloy, Magnesium alloy	02
2	Composition, properties and uses of Brass, Types of brass	03
3	Bronze, Types of bronze	03
4	Gun metal, Muntz metal	02
5	Cartridge brass, Admiral brass,	02
6	German silver,	01
7	Some Important Alloys , Composition, properties and Uses Constantan type metal, Invar, Bell metal	02
8	Babbitt metal and Bearing metals.	02

No. of Periods (Hours): 60
No. of Periods (Hours) actually taken:

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

LESSION PLAN**Subject – Industrial Engineering****Semester - 6th**

S.No.	No. Of Periods	Topic Name	Remarks
	(Approx.Hrs: CI = 08)	Unit 1.0 INTRODUCTION- INDUSTRIAL ENGINEERING (I.E.) 1.1 Overview of Industrial Engineering 1.1.1 definition and objectives 1.1.2 Need, scope and applications of Industrial Engineering 1.2 Work Study and Work measurement 1.2.1 Definition 1.2.2 Objectives, scope and relation of work study with management, supervisors & workers 1.2.3 Work measurement –Definition, objectives and benefits 1.2.4 Work measurement techniques - Time Study, Work sampling. Determination of time standards and Performance Rating	
	(CI-08)		
	(Approx. Hrs: CI = 08)	Unit 2.0 Management principles and leadership 2.1 Definition of management 2.2 Function of management 2.3 Principle of management 2.3.1 Fayol's management 2.3.2 Taylor's management 2.4 System thinking concept 2.4.1 System design 2.4.2 Procedure 2.4.3 System variable 2.4.4 System thinking model's 2.5 Supervision and leadership 2.5.1 Concept of supervision 2.5.2 Need of supervision 2.5.3 Role of supervisor in industry 2.5.4 Older workers and their supervision 2.5.5 Qualities of good leader 2.5.6 Effectiveness of leadership	
	(CI = 08)		
	(Approx. Hrs: CI = 10)	Unit 3.0 Production Planning and control 3.1 Meaning and Concept of PPC 3.2 Production system 3.3 Function of PPC 3.4 Classification and Characteristics of PPC 3.5 Production and consumption rate 3.6 Types of production 3.6.1 Job production 3.6.2 Batch production 3.6.3 Mass production	

		3.7 Batch size, Buffer stock, Production cost components 3.8 Loading and scheduling 3.8.1 Concept of production scheduling 3.8.2 Difference between loading and scheduling 3.8.3 Gantt chart scheduling 3.8.4 Advantage and preparation of Gantt chart	
	(CI = 10)		
	(Approx. Hrs: CI = 08)	Unit 4.0 Material Handling 4.1 Introduction 4.2 Function and principle 4.3 Objectives 4.4 Material handling devices for metallurgical applications of industry 4.4.1 Manual handling device 4.4.2 Mechanical handling device 4.5 Advantage 4.6 Engineering and economic factor	
	(CI = 08)		
	(Approx. Hrs: CI = 12)	Unit -5.0 Method Study and SQC (Statistical Quality Control) 5.1 Method Study 5.1.1 Objectives, scope and procedure 5.1.2 Charts: - Process Chart, Flow process charts, multiple activity charts, Man Machine Chart, Two hand Chart and Simultaneous motion Chart. 5.2 Statistical Quality Control 5.2.1 Concept of variability, variables and attributes 5.2.2 SQC tools and statistical fundamentals 5.3 Control charts for variable quality:- Types, applications, calculations of control limits and range/mean, methods to plot and interpretations X bar-R chart and related examples	
	(CI- 12)		

Number of periods planned :

Subject Teacher : - Gaurav Verma

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Lesson plan	
Course- Foundry Technology	Session-Jan-June 2026
Course instructor-Abhinandan kumar	Semester-6
TOPIC	NO.OF PERIODS (HOURS)
UNIT-1 Introduction and pattern Making	12
Introduction of foundry Technology	1
Raw materials used in foundry	2
Basic steps in making casting	1
Different pattern materials	2
Pattern making tools	1
Different types of pattern	2
Design and allowances for various patterns	2
Color code for pattern	1
UNIT-2 Mold and Core Making	12
Molding sand and molding tools	3
Additives and Binders	3
Different molding test	2
Core making	2
Types of Core and making processes	2
UNIT-3 Melting , Gating and riser system	15
Different melting furnaces	2
Cupola Induction Furnace	2
Electric Arc furnace	2
Gating and Riser system	2
Purpose of gating system, Different elements of gating system	2
Riser, Functions and types	3
Chills, Functions and types	2
UNIT-4 Casting process and solidification of casting	12
Sand casting	2
Plaster mold casting, Die casting, centrifugal casting,	3
Shell mold casting, Continuous casting	3
Solidification of casting	4
UNIT-5 Casting defects and inspection of casting	10
Blow holes, pin holes, Gas holes, scab, Hot tears	3
Cold cracks, shrinkage cavity	2
Inspection of castings	2
Non Destructive test to identify casting defects	3

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR	
Department of metallurgical engineering	
Lesson plan	
Course- Non Metallic and Advanced Materials	Session-Jan-June2026
Course instructor-Gourav Verma	Semester-6
TOPIC	NO.OF PERIODS (HOURS)
UNIT-1 Introduction of Materials	10
Classification of materials	1
Metals, Ceramics ,Polymers & composites	2
Advanced materials	1
Electronic materials & Biomaterials	1
Smart material, Nanomaterial & Biodegradable material	2
Need, Scope & application of advanced /modern material	1
Properties required in engineering materials & criteria of selection of materials	1
Overview of composites	1
UNIT-2 Non Metallic Materials	12
Synthetic & Natural materials, properties of metallic and non- metallic and non- metallic materials.	6
Rubber, Plastics, Ceramic, Adhesive & Optical fibre (types, processing, merits, limitations and examples)	6
UNIT-3 Advanced Materials	14
Smart materials, Shape memory alloys properties & applications	2
Piezoelectric materials , Electro & Magneto - rheological fluid	2
Biomaterials, Important bio metallic alloys properties and applications	2
Miscellaneous advanced materials- definition, properties, application & limitation.	3
Magnetic materials, surface metal matrix composites, aerospace materials & cryogenic materials.	3
Semiconducting , Super conducting & Electronic materials	2
UNIT-4	14
High strength materials, alloys and applications & recent developments.	5
Nano materials, types of nanomaterials including carbon nanotubes and Nano composites.	5
Application of Nano materials and recent developments in Nano materials.	4
UNIT-5 Materials for Low & High temperature applications	12
Properties required for low and high temperature applications.	3
Materials available for low & high temperature applications its properties	3
Application of low & high temperature materials with example.	3
Recent developments in the field of materials used for low and high temperature applications.	3