GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Chemical Engineering				
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2026-27	Effective for the batch Admitted in		July 2025
Subject code	1CH3104	Subject Name	Chemical Engineering Materials		

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	1CH3104	2	-	0	0	4	2	40	60	100	40	-	-	-	-	20	08	120

Abbreviation:	**CL**- Classroom Learning	**TL** - Tutorial Learning	**LL** - Laboratory Learning
	SLH - Self Learning Hours	**NLH** - Notional Learning Hours	**SLA** - Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA** - Summative Assessment

II. PRE-REQUISITES

Chemistry

III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES

The outcome expected from this course is to help the chemical engineering students to attain the industry/employer identified competency about the existing chemicals engineering materials used in different industries and their applications through various teaching learning experiences.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1: Develop the basics for engineering materials, their properties, and selection.

CO2: Acquire knowledge of metallurgy and the manufacturing/classification of steel.

CO3: Learn the basics of metals, non-ferrous alloys, and their mechanical properties.

CO4: Understand ceramic materials, polymers, rubbers, and wood properties and packaging materials.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's)&CO's	Marks	Hours
Unit-1: Introduction & Engineering Properties	**TLO 1.1** Classify engineering materials **TLO 1.2** Explain selection criteria for materials **TLO 1.3** Define thermal properties (MP/BP) **TLO 1.4** Explain heat capacity and conductivity **TLO 1.5** Define mechanical Stress and Strain **TLO 1.6** Analyze factors affecting material properties	**1.1** Scope and classification of engineering materials **1.2** Fundamental structure and selection criteria **1.3** Thermal properties: MP, BP, Expansion coefficient **1.4** Thermal insulation and conductivity **1.5** Stress, strain, and mechanical behavior **1.6** Factors affecting material properties .	**07**	**04**
Unit-2: Metallurgy & Steel Production	**TLO 2.1** Define principles of chemical metallurgy. **TLO 2.2** Describe ore dressing and calcination.	**2.1** Chemical metallurgy principles **2.2** Ore dressing, calcination, and roasting.	**10**	**05**

	TLO 2.3 Explain extraction of Cu, Al, and Zn. **TLO 2.4** Describe the manufacture of steel. **TLO 2.5** Classify Carbon and Stainless steel. **TLO 2.6** Compare different properties of engineering materials **TLO 2.7** Explain heat treatment of steel. .	**2.3** Metal extraction (Copper, Aluminum, Zinc). **2.4** Manufacture of steel from iron. **2.5** Classification: Carbon and Stainless steel. **2.6** Comparison of engineering materials **2.7** Impurities and heat treatment processes		
Unit-3: Metals, Alloys & Joining	**TLO 3.1** Analyze the Iron-Carbon system. **TLO 3.2** Describe properties of wrought iron. **TLO 3.3** Identify purification furnaces. **TLO 3.4** Explain objectives of alloying. **TLO 3.5** Classify Non-ferrous alloys. **TLO 3.6** Describe soldering and welding	**3.1** Iron-Carbon system analysis. **3.2** Mechanical properties of steel and iron. **3.3** Furnaces for metal purification. **3.4** Alloy compositions (Bronze, Brass, Monel). **3.5** Nickel, Lead, and Aluminum base alloys . **3.6** Soldering and welding of metals.	**14**	**07**
Unit-4: Polymers & Ceramic Materials	**TLO 4.1** Define properties of clay and bentonite. **TLO 4.2** Describe glass manufacturing and types. **TLO 4.3** Explain cement and porcelain properties. **TLO 4.4** Distinguish polymer types and structure. **TLO 4.5** Classify plastics and their properties. **TLO 4.6** Describe natural and synthetic rubbers.	**4.1** Clay, fire clay, and bentonite. **4.2** Manufacturing and types of glasses. **4.3** Porcelain and Cement application. **4.4** Addition and Condensation Polymerization. **4.5** Classification and properties of plastics. **4.6** Rubbers and vulcanization processes.	**17**	**08**
Unit-5: Special Applications & Packaging	**TLO 5.1** Classify industrial paints and varnishes. **TLO 5.2** Identify ingredients of coatings. **TLO 5.3** Describe electric and thermal insulation. **TLO 5.4** Classify and explain adhesives. **TLO 5.5** State objectives of packaging. **TLO 5.6** Describe paper and foil packaging.	**5.1** Paint classification and properties, Ingredients of paints and varnishes. **5.2** Special types of paints and Definition and types of varnishes. **5.3** Requirements for industrial packaging and use of paper, cardboard, and aluminum foil. **5.4** Introduction of air compressor, working principle and its application. **5.5** Thermal insulation and Sound insulation materials. **5.6** Sound insulation materials and Classification of industrial adhesives.	**12**	**06**

VI. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1	Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
2	Engineering Materials	S.C. Rangwala	Charotar Book
3	A Text Book of Applied Chemistry	J. Rajaram	Tata McGraw Hill Co. New Delhi
4	Materials & Metallurgy	G. B. Narang & V. K	Manchanda, Khanna Publishers
5	Inorganic chemistry	P.L.Soni,	Sultan Chand & Sons
6	Material science and Engineering	William D Callister	John-Wiley

VII. LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in/courses/112108150
2	https://www.youtube.com/watch?v=KX1_NqNTIqw
3	https://www.dnatube.com/video/18844/Lec-1-Introduction-to-Chemical-Engineering?utm_source=chatgpt.com

VIII. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Introduction & Engineering Properties	CO1	04	02	04	01	07
2	Power Transmission & Safety	CO2	05	02	06	02	10
3	Metals, Alloys & Joining	CO3	07	04	07	03	14
4	Polymers & Ceramic Materials	CO4	08	05	08	04	17
5	Special Applications & Packaging	CO4	06	03	06	03	12
	Grand Total		30	16	31	13	60

IX. COs AND POs AND PSOs MAPPING

Course outcome (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	2	3	2	3	1	3	3	1
CO2	1	1	2	2	2	1	2	3	2	1
CO3	2	2	1	2	2	2	2	2	2	1
CO4	1	2	2	3	2	3	1	3	3	1

Legends: - *3- High 2-Moderate/Medium 1-Slight/Low 0-None*