GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Chemical Engineering / Petrochemical Technology		
Semester	III	Version	1.0.0.0
Effective from Academic Year	2026-27	Effective for the batch Admitted in	JULY 2025
Course code	1CH3101	Course Name	Industrial Stoichiometry

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	1CH3101	3	-	0	3	6	3	40	60	100	40	-	-	-	-	20	8	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

Basic knowledge of chemistry, units and dimensions, and elementary mathematics.

III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES

Graduates are expected to apply stoichiometric principles to analyze material and energy balances in chemical industries, ensuring process efficiency, safety, and sustainability.

IV. COURSE LEARNING OUTCOMES

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

CO1: Apply dimensions, units, stoichiometry, and solution properties to perform chemical engineering Calculations.

CO2: Analyze ideal gas behavior and gas–vapor mixtures using Dalton's law, Amagat's law, and Composition relations.

CO3: Formulate and solve material balance problems for chemical processes with and without chemical Reactions.

CO4: Apply energy balance principles and thermochemical calculations of simple chemical process Systems.

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 Chemical and physical principles	**TLO1.1**Explain dimensions, units, and conversion factors **TLO1.2**Apply stoichiometric and mass relations in reactions **TLO 1.3** Relate mass, volume, and molar concepts **TLO 1.4** Explain properties of solutions	**1.1** Dimensions, SI units, and conversion factors used in chemical engineering calculations. **1.2** Stoichiometric and mass relations in chemical reactions using balanced equations. **1.3** Relationship between mass, volume, and moles using molar concepts. **1.4** Properties and concentration terms of solutions applied to stoichiometric problems.	**12**	**9**
Unit 2 Behaviours for ideal gases	**TLO 2.1** Explain Dalton's law and Amagat's law **TLO 2.2** Analyze gas mixture compositions	**2.1** Dalton's law of partial pressures and Amagat's law for gas mixtures.	**10**	**8**

	TLO 2.3 Evaluate vapor composition in gas mixtures	**2.2** Composition analysis of gas mixtures using mole fraction and partial pressure relationships. **2.3** Vapor composition and phase behavior in gas–vapor mixtures relevant to chemical processes.		
Unit 3 Material balance	**TLO 3.1** Explain concepts and importance of material balance **TLO 3.2** Solve material balance problems with recycle and purge **TLO 3.3** Apply material balance to unit operations	**3.1** Concept, definition, and importance of material balance in chemical processes. **3.2** Material balance calculations involving recycle, purge, and bypass streams. **3.3** Application of material balance to unit operations in chemical industries.	**16**	**12**
Unit 4 Material balance with chemical reactions	**TLO 4.1** Formulate steady-state material balance with reactions **TLO 4.2** Solve material balance problems involving reactions	**4.1** Formulation of steady-state material balance equations for chemical processes involving reactions. **4.2** Solution of material balance problems with chemical reactions using stoichiometric relationships.	**10**	**7**
Unit 5 Energy balance	**TLO 5.1** Explain forms of energy balance **TLO 5.2** Calculate enthalpy changes **TLO 5.3** Solve simple energy balance case studies	**5.1** Forms of energy, and concepts of heat, work, Cp, and Cv. **5.2** Calculation of enthalpy changes for physical and chemical processes. **5.3** Simple energy balance case studies applied to chemical process systems.	**12**	**9**

VI. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

Assignment on unit conversion, molar calculations, and stoichiometry.

Problem-solving on gas mixture behavior using Dalton’s and Amagat’s laws.

Case study on material balance with recycle, purge, or bypass streams.

Reaction-based material balance calculations for steady-state processes.

Energy balance and enthalpy calculation for a simple chemical process.

VII. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1	Stoichiometry and Process Calculations	K.V. Narayanan & B. Lekshmikutty	PHI
2	Stoichiometry	B.I. Bhatt & S.B. Thakore	Tata McGraw-Hill
3	Basic Principles and Calculations in Chemical Engineering	Himmelblau & Riggs	PHI

VIII. LINK OF LEARNING WEB RESOURCE

1	NPTEL: https://nptel.ac.in/courses/103103165

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Chemical and Physical Principles	CO 1	9	4	4	4	12
2	Behaviours for Ideal Gases	CO2	8	3	4	3	10
3	Material Balance	CO3	12	3	5	8	16
4	Material Balance with Chemical Reactions	CO3	7	2	3	5	10
5	Energy Balance	CO4	9	3	4	5	12
		Grand Total	**45**	**15**	**20**	**25**	**60**

X. COs AND POs AND PSOs MAPPING

Course outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
CO 1	3	2	1	1	1	1	1	2	1	2
CO 2	3	3	1	2	1	1	1	2	1	2
CO 3	3	3	2	2	1	1	1	3	1	2
CO 4	3	3	2	2	1	1	1	3	1	2

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