

GANPATIUNIVERSITY
FACULTYOFENGINEERING&TECHNOLOGY

Programme	BachelorofTechnology			Branch/Spec.	ChemicalEngineering					
Semester	III			Version	1.0.0.0					
EffectivefromAcademicYear	2025-26			EffectiveforthebatchAdmittedin	July2025					
Subjectcode	2CH3101	SubjectName		Industrial Chemical Calculations						
Teachingscheme				Examinationscheme(Marks)						
(Perweek)	Lecture(DT)	Practical(Lab.)	Total		CE	SEE	Total			
	L	TU	P	TW						
Credit	3	1	0	0	4	Theory	40			
Hours	3	1	0	0	4	Practical	0			
Pre-requisites:										
<ol style="list-style-type: none"> 1. Basic Principles in Process Calculations. 2. Introductory knowledge of chemistry. 										

Course Outcomes (COs)

CO1: Apply fundamental chemical calculations involving unit conversions, stoichiometry, and reaction parameters like excess reactant, conversion, and yield.

CO2: Analyze gas behavior and phase equilibrium using ideal gas laws, vapor pressure, and psychrometric charts.

CO3: Perform material balance calculations for reactive and non-reactive systems, including recycle, purge, and bypass.

CO4: Evaluate energy balances by applying heat capacity, heat of reaction, and combustion principles for process optimization.

Theorysyllabus

Unit	Content	Hrs.
1	Review of Concepts Importance of industrial chemical calculations in chemical engineering, Basic principles, the concept of gram atom and gram mole, conversion of units from one system to another, concept of excess reactant, conversion and yield, Selectivity and degree of completion of reaction.	10
2	Ideal Gas Law: Ideal gases, partial pressure, vapor pressure, application of ideal gas laws, volume changes with changes of composition, Humidity, dew point, and psychrometric chart, solubility and crystallization.	12
3	Material Balance Reaction: Material balance without chemical reaction, recycle, purge and bypass calculations, material balance with chemical reaction.	14
4	Energy Balance Without Chemical Reaction: Sensible heat, latent heat, and heat capacity, Energy balance without chemical reaction, Heat of reaction, heat of formation, and heat of combustion, Combined material and energy balances	12
5	Energy Balance with Chemical Reaction: Energy balance with chemical reaction, combined material and energy balances, Fuels and combustion, types of fuels, heating values of fuels, theoretical and excess air, heat and combustion problems	12

TextBooks

1	Stoichiometry and Process Calculation by Narayana K. V., Laxmikutty B., Prentice Hall of India, 2006.
2	Basic Principles and Calculations in Chemical Engineering by Himmelblau D. M. & Riggs, J. B. Prentice Hall of India, 6 th Edition, 2011.

ReferenceBooks

1	Stoichiometry by Bhatt B. I., Vora S. M. Tata-McGraw-Hill 4 th Edition, 2004.
2	Chemical Process Calculation by Hougen A., Watson, M. John Wiley & Sons, Third Edition, 2000

ICT/MOOCs references

- 1 <https://www.youtube.com/watch?v=-Zrvfgfi0Zs>
- 2 <https://nptel.ac.in/courses/103105110/>
- 3 <http://www.nptelvideos.in/2012/12/materials-and-energy-balance.html>

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	1	1	1	1	1	1	2	3	2	3
CO2	3	3	2	2	2	2	2	1	1	1	1	2	3	3	2
CO3	3	3	3	3	2	2	2	1	1	1	2	2	3	3	3
CO4	3	3	3	3	3	3	2	1	1	1	2	2	3	3	3