GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Chemical/Petrochemical
		Version	1.0.0.0
Semester	II	Course Category	Engineering Science
Course Code	2ESC1111	Course Name	Introduction to Chemical Engineering
Effective from Academic Year	2026-27	Effective for the batch Admitted in	July 2026

Teaching, Learning and Examination Scheme

Teaching & Learning Scheme							Examination scheme (Marks)					
Hours (per week)				Cr	SL	TSL	Theory			Practical		
L	TU	P	TTH				CE	SEE	Total	CE	SEE	Total
3	0	0	3	3	45	90	50	50	100	00	00	00

L: Lecture, TU: Tutorial, P: Practical, TTH: Total Teaching Hours/Week, Cr: Credit, SL: Min. Self-Learning/Term Work Hours/Sem, TSL: Min. Total Teaching & Learning Hours/Sem, CE: Continuous Evaluation, SEE: Semester End Examination,

Pre-requisites

N/A

Course Outcomes

COs	Description
CO1	Explain the fundamentals, scope, and role of chemical engineering in various industries and societal development.
CO2	Describe the core components of chemical engineering, including basic principles of thermodynamics, transport phenomena, kinetics, process design, and control.
CO3	Identify major chemical process industries, unit operations, and unit processes, and explain their applications in chemical engineering practice.
CO4	Understand the basic concepts of Artificial Intelligence and Machine Learning and recognize their emerging applications in chemical engineering and smart manufacturing.

Theory Syllabus

Unit	Content	Hrs
1	**Basics of Chemical Engineering:** Concept and definition of Chemical Engineering; historical development and growth of the discipline; scope and distinguishing features of Chemical Engineering; roles and responsibilities of chemical engineers in industry and society; landmark inventions and breakthroughs; major achievements in chemical engineering; contributions of renowned chemical engineering personalities.	8
2	**Fundamental Components of Chemical Engineering:** Application and role of chemical engineers in food, pharmaceutical, energy, environmental, biochemical, electronics, and allied industries; importance of physical sciences, mathematics, and biological sciences in chemical engineering; overview of fundamental subjects such as thermodynamics, transport phenomena, chemical kinetics, process dynamics, process design, and process control.	8
3	**Chemical Process Industries and Applications** Use of computers in chemical engineering; introduction to chemical engineering software tools; relationship between chemical engineering and other branches of engineering; historical evolution of chemical industries; technological advancements addressing industrial challenges; structure and classification of chemical industries; industrial segments, raw materials, and production patterns.	8
4	**Principles of Unit Operations:** Introduction to unit operations in chemical engineering; mechanical separation processes; fluid flow operations; fundamentals of heat transfer operations; mass transfer operations; combined heat and mass transfer operations and their industrial significance.	9
5	**Unit Processes in Chemical Industries:** Overview of unit processes in chemical engineering; principles and industrial applications of nitration, halogenation, alkylation, sulfonation, amination, polymerization, oxidation, and hydrogenation processes.	7
6	**Fundamental and Applications of AI and ML in Chemical Engineering:** Fundamentals of AI and ML and their relevance to chemical engineering, Overview of optimization concepts and AI/ML software tools, Applications of AI in chemical engineering including fault diagnosis, process control, process and separation design, modeling and simulation, heat-exchanger network synthesis, thermodynamic model and property estimation, Types of neural networks.	5

Practical Content	
Text Books	
1	Introduction to Chemical Engineering, Anderson, L.B., Wenzel, L.A. McGraw-Hill Book Company, Inc., New York (1961).
2	Introduction to Chemical Engineering, Ghosal, S.K., Sanyal, S.K., Datta, S. Tata McGraw-Hill Publishing Company Ltd., New Delhi (1997).
Reference Books	
1	Unit Operations of Chemical Engineering" – Warren L. McCabe, Julian C. Smith & Peter Harriott
2	Chemical Process Industries" – Shreve's Chemical Process Industries (George T. Austin & Richard H. Perry or updated versions)
3	Artificial Intelligence in Chemical Engineering" — Edited by Farooq Sher
ICT/MOOCs Reference	
1	https://nptel.ac.in/courses/104106119
2	https://nptel.ac.in/courses/104101115

Mapping of Cos, POs, and PSOs

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	1	1	1	1	1	2	2	1	1	1	2	1	1
CO2	3	2	1	1	1	1	1	1	1	1	1	2	1	1
CO3	2	2	2	1	1	1	2	1	1	1	1	2	2	1
CO4	2	2	1	1	3	1	1	1	1	1	1	1	2	1

Unit	Unit Title	Aligned COs	Learning Hours	BTL Level
1	Basics of Chemical Engineering	CO 1	8	U
2	Fundamental Components of Chemical Engineering	CO 2	8	U, A
3	Chemical Process Industries and Applications	CO 3	8	U, A
4	Principles of Unit Operations	CO 3	9	U, A
5	Unit Processes in Chemical Industries	CO 3	7	U
6	Fundamental and Applications of AI and ML in Chemical Engineering	CO 4	5	R, U

Note:

- Version 1.0.0.0 (First Digit= New syllabus/Revision in Full Syllabus, Second Digit=Revision in Teaching Scheme, Third Digit=Revision in Exam Scheme, Forth Digit= Content Revision)
- L=Lecture, TU=Tutorial, P= Practical/Lab., TW= Term work, DT= Direct Teaching, Lab.= Laboratory work CE= Continuous Evaluation, SEE= Semester End Examination
- 1 Hour Lecture = 1 Credit, 1 Hour Tutorial = 1 Credit, 2 Hours Practical = 1 Credit, 2 Hours Internship/Project/Seminar = 1 Credit
- As per NCrF/NEP 2020, Minimum Self-Learning or Term Work Hours per Semester should be calculated in such a way that 1 Credit should have minimum 30 Hours of Teaching and Self Learning Engagement per semester