

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Master of Technology				Branch/Spec.		Chemical Engineering	
Semester		II				Version		1.0.0.0	
Effective from Academic Year			2026-27			Effective for the batch Admitted in			July 2026
Subject code		3CH21PE12		Subject Name		Catalytic Reaction Engineering			
Teaching scheme						Examination scheme (Marks)			
(Per week)		Lecture (DT)		Practical (Lab.)		Total			
		L	TU	P	TW			CE	SEE
Credit		3	0	0	0	3	Theory	40	60
Hours		3	0	0	0	3	Practical	0	0
Pre-requisites:									
Chemical Reaction Engineering on UG level and Advanced Chemical Reaction engineering on PG level									
Course Outcomes									
On successful completion of the course, the students will be able to:									
CO1	Explain catalyst fundamentals including types of catalysis, catalyst preparation methods, and characterization techniques such as BET and XRD, and interpret their relevance to catalytic performance.								
CO2	Develop and analyze rate equations for solid-catalyzed reactions and evaluate reactor performance for porous catalyst systems.								
CO3	Design and evaluate packed bed and fluidized bed catalytic reactors, trickle beds, and slurry reactors, based on appropriate contacting and hydrodynamic models.								
CO4	Analyze mechanisms of catalyst deactivation and propose strategies for catalyst and process design to mitigate deactivation.								
Theory syllabus									
Unit	Content								Hrs
1	Catalyst Fundamentals: Types of catalysis, preparation methods, and characterization techniques (BET, XRD).								8
2	Solid catalyzed reactions: Rate equation for surface kinetics, pore diffusion in porous catalyst particles, heat effects during reaction, performance equations for reactors with porous catalyst particles, experimental methods for finding rates, product distribution in multiple reactions								8
3	Packed bed catalytic reactor design: Staged adiabatic packed bed reactors with intercooling, recycle, mixed flow reactors, choice of contacting system								9
4	Fluidized bed reactor design: Introduction to reactors with suspended solids, Bubbling fluidized bed, K-L model for BFB, general rate equation for trickle beds and slurry reactors								10
5	Deactivating catalyst – Mechanism of catalyst deactivation, rate and performance equations, catalyst design								10
Text Books									
1	Chemical Reaction Engineering (3 rd Ed.) Wiley Publisher, 2006 by Octave Levenspiel								
2	Elements of Chemical Reaction Engineering (4 th Ed.) Prentice Hall India Pvt Learning Ltd, 2008 by H Scott Fogler								
Reference Books									
1	Chemical Engineering Kinetics by J.M Smith								
2	Chemical Reactor Analysis and Design by G.F Froment & K.B Bischoff								
ICT/MOOCs references									

1. <https://nptel.ac.in/courses/103102012>
2. <https://nptel.ac.in/courses/103108097>

Mapping of CO with PO and PSO:														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	-	-	-	-	-	1	2	-	-
CO2	3	3	-	1	1	-	-	-	-	-	1	3	-	-
CO3	3	3	1	2	1	-	-	-	-	-	1	3	1	-
CO4	3	3	3	2	2	1	-	-	-	1	2	3	2	1