

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Master of Technology				Branch/Spec.		Chemical Engineering	
Semester		I				Version		1.0.0.0	
Effective from Academic Year			2026-27			Effective for the batch Admitted in			July 2026
Subject code		3CH1103		Subject Name		Advanced Reaction Engineering			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	0	0	3	Theory	40	60	100
Hours	3	0	0	0	3	Practical	0	0	0
Pre-requisites:									
Chemical Reaction Engineering on UG level									
Course Outcomes									
On successful completion of the course, the students will be able to:									
CO1	To develop understanding of non-ideal reactor design.								
CO2	Understand the concept of heterogeneous reaction system for reactor design.								
CO3	Study complex heterogeneous chemical reaction mechanisms and kinetics								
CO4	Reactor design and stability, including consideration of multiple steady states using non isothermal energy balance								
Theory syllabus									
Unit	Content								Hrs
1	Non ideal and non-isothermal reactor study: Review of isothermal and Adiabatic reactor design. Steady and unsteady state operations. Heat effects. Concept of multiple study state in CSTR. Homogeneous reactor design and analysis for non-ideal reactors. Residence time distributions (RTD) studies. Single and multi-parameter models for real reactor behavior, macro and micro mixing, segregated flow model								10
2	Heterogeneous reactor studies: Heterogeneous reactors-gas-solid systems-Reviews of kinetics of gas-solid catalytic reactions with and without diffusion limitations. Solid catalysts and application in reactor design for fixed and fluidized bed reactors.								10
3	Study of gas liquid reactive systems: Design for non-catalytic gas-liquid reactions. Review of kinetic regimes in reactor design, case studies. Gas-liquid systems, basic theories of mass transfer with chemical reaction. Reactor design for mechanically agitated and bubble column reactors, selected case studies								15
4	Biochemical reaction: Biochemical reaction and Bio-reactors: Enzyme Fermentation, microbial fermentation, substrate-limiting and product limiting Microbial fermentation. Bio-reactor design								10
Text Books									
1	O. Levenspiel, Chemical Reaction Engineering, Wiley Eastern, 3 rd Ed., 2000								
2	Scott Fogler, H, Elements of Chemical Reaction Engineering – PHI- 4th Edition- 2005.								
Reference Books									
1	Carberry, J.J. Chemical and Catalytic reaction engineering, Doven Publishers, 2001								
2	Rawlings J.B. and Ekerd, J.G., Chemical Reactor Analysis and Design Fundamentals Nole. Hill 2002								
ICT/MOOCs references									
https://nptel.ac.in/courses/103106116									
https://nptel.ac.in/courses/103106117									

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