

NIRMA UNIVERSITY
School of Engineering, Institute of Technology
B.Tech. in Chemical Engineering
Third Year /Semester VI

Institute:	Institute of Technology
Name of Programme:	B. Tech. (Chemical Engineering)
Course Code:	3CH302CC24
Course Title:	Chemical Reaction Engineering-II
Course Type:	Core
Year of introduction:	2024-25

L	T	Practical component			
		LPW	PW	W	S
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. interpret the behaviour of various types of contacting patterns and kinetics involved in non-catalytic systems (BL2)
2. identify non-ideality present and predict its effects on performance of reactor (BL3)
3. select and design suitable reactor for heterogeneous reactions (BL5)
4. examine and characterise various supported catalysts (BL4)

Total Teaching hours: 45

Syllabus:

		Teaching hours
Unit I	Heterogeneous Reactions and Kinetics Introduction to heterogeneous reactions and contacting patterns for two phase systems, kinetics and design for fluid-fluid and fluid-solid reactions.	09
Unit II	Non-ideal Reactors Basics of non-ideality present in the reactor, concept of residence time distribution, compartment model, dispersion model, tanks in series model, non-ideal reactor configurations	09
Unit III	Catalysis Overview of physicochemical properties of catalyst, preparation of bulk and supported catalyst, catalyst characterisation techniques, catalyst deactivation and regeneration	10
Unit IV	Solid Catalysed Reactions Rate equation for surface kinetics, pore diffusion resistance combined with surface kinetics, experimental methods of finding rate.	09
Unit V	Catalytic Reactors Packed bed catalytic reactor, fluidised bed reactor, trickle bed reactor, slurry reactor.	08

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on the above content of course.

Suggested Readings/References:

1. Levenspiel O., Chemical Reaction Engineering, Wiley Publications.
2. Fogler H S., Elements of Chemical Reaction Engineering, Prentice Hall Publications.
3. Froment G. F, Bischoff K. B and Wilde J. D., Chemical Reactor Analysis and Design, Wiley Publications.

L= Lecture, T=Tutorial, P= Practical, C=Credit

List of Experiments:

Sr. No.	Practical	No. of Hours
1	RTD studies in continuous stirred tank reactor	02
2	RTD studies in coil tube reactor	02
3	RTD studies in a continuous stirred tank reactors in series	02
4	RTD studies in plug flow reactor	02
5	Step response of continuous stirred tank reactor	02
6	RTD studies in packed bed reactor	02
7	Catalyst preparation by wet impregnation method	02
8	Catalyst preparation by co-precipitation method	02
9	Combustion characteristics of coal particles	02
10	Flow through fluidised bed reactor	02