INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING**
SEMESTER	**2**
COURSE TITLE	**ADVANCED CHEMICAL REACTION ENGINEERING LABORATORY**
COURSE CODE	**01CM0214**
COURSE CREDITS	**2**

Objective:

1 To equip students with practical knowledge and analytical skills to study reaction kinetics, evaluate reactor performance, and optimize chemical processes through experimentation and data-driven approaches in various reactor configurations and conditions

Course Outcomes: After completion of this course, student will be able to:

1 Analyze and determine reaction kinetics, including rate constants, reaction order, and catalytic activity, for various chemical and biochemical systems.

2 Evaluate the performance and operational efficiency of different reactor types (batch, CSTR, PFR, and packed-bed) and their configurations (series or parallel)

3 Investigate the effects of operating parameters such as temperature, mass transfer, and flow patterns on reactor performance and scale-up processes.

4 Develop critical analytical and experimental skills to identify deviations from ideal reactor behavior and apply corrective measures for optimized design and operation.

Pre-requisite of course: To have the knowledge of theoretical concepts of chemical reaction engineering

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	4	0	0	0	50	50

Contents : Unit	Topics	Contact Hours
Total Hours		

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment 1** Study of reaction rate constants and order for a liquid-phase reaction.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
2	**Experiment 2** Determination of conversion and residence time for first-order and second-order reactions.	2
3	**Experiment 3** Performance evaluation and reaction kinetics in a tubular reactor.	2
4	**Experiment 4** Study of CSTRs and PFRs in series or parallel configurations.	4
5	**Experiment 5** Investigation of flow patterns in ideal and non-ideal reactors.	4
6	**Experiment 6** Analysis of catalyst activity and effectiveness in a packed-bed reactor.	4
7	**Experiment 7** Study of temperature effects on reaction rates in a non-isothermal reactor.	2
8	**Experiment 8** Simulation and comparison of laboratory-scale reactor data for scaling purposes.	2
9	**Experiment 9** Study to determine kinetic parameters for Enzyme-catalyzed reaction.	2
10	**Experiment 10** Study of mass transfer and reaction in a bubble column reactor.	2
11	**Experiment 11** Performance analysis of light-activated reactions using a photocatalyst.	2
12	**Experiment 12** Study of heat transfer in exothermic and endothermic reactions.	4
13	**Experiment 13** Study of deviations in reactor performance from ideal models	2
14	**Experiment 14** Determination of rate constants for dissolution or leaching reactions.	4
Total Hours		**38**

Textbook :

1 Chemical reaction engineering. , Levenspiel, O. , John wiley & sons., 1998

References:

1 Advances in chemical engineering., Advances in chemical engineering., Nawaz, Z., & Naveed, S. , BoD–Books on Demand, 2012

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	30.00	30.00	10.00	

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
4. Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory

Supplementary Resources:

1. https://archive.nptel.ac.in/courses/103/101/103101001/

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