INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING**
SEMESTER	**2**
COURSE TITLE	**CHEMICAL REACTION ENGINEERING**
COURSE CODE	**01CM1205**
COURSE CREDITS	**3**

Objective:

1 To be familiar with the non-ideal reactors and heterogeneous reactions and to apply this knowledge to solve the problems in chemical reaction engineering.

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

1 Understand the suspended solid catalysed reactions

2 Familiarize the non-ideal flow patterns in chemical reaction engineering problems.

3 Design catalytic reactor with regenerator.

4 Design reactors that operate at steady state and involve heat effects.

Pre-requisite of course: Knowledge of non-ideal reactors and heterogeneous reactions.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Non Ideal Flow** Non-ideal flow with stress on single parameter i.e. Dispersion Model and multipara meter models	6
2	**Fluid - Fluid Reactor Design** Gas absorption systems with chemical reaction, Rate equation for straight mass transfer, Rate equation for mass transfer and reaction, Review of the role of Hatta number, Kinetic regime from solubility data	8
3	**Fluid Catalyst reaction and reactors with suspended solid catalyst, Fluidized Reactor of various types** Mechanism of solid catalysed reactions i.e Thiele Modulus for various shapes of catalyst and effectiveness factor, Fluidized reactors: Background information ????the bubbling fluidized bed (BFB), the K-L model for BFB ????the circulating fluidized bed (CFD) -the jet impact reactor.	8

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Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
4	**Non Isothermal Reactors** Energy Balance, Adiabatic Operation, Steady State Tubular Reactor with Heat Exchange, Equilibrium Conversion, Reactor Staging with Inter Stage Cooling or Heating, CSTR with Heat Effects, Multiple Steady States	8
5	**Design of Non-conventional Reactors** Kinetics of Bio-Reaction, Monod Equation, Design of Bioreactors, Reactions in Solids, Reactors for Solid Reactions, CVD Reactors, Monolithic Reactors, Gauze Reactors	8
Total Hours		**38**

Textbook :

1 Essentials of chemical reaction engineering: essenti chemica reactio engi. , Fogler, H. S., Pearson education., 2010

References:

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

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://www.youtube.com/watch?v=VwEEeAUpvN4