

# GUJARAT TECHNOLOGICAL UNIVERSITY

## B.E. SEMESTER : VIII

### CHEMICAL ENGINEERING

Subject Name: **CHEMICAL REACTION ENGINEERING II**

Sr. No.	Course Contents
1.	Non Ideal Flow, Residence time distribution, The E,F and C Curves, their interrelationship, ways of using age distribution function, Single parameter model for nonideal flow, Dispersion model, Chemical Reaction and dispersion, Intensity of fluid mixing. Tanks in series model, conversion, Deviation from plug flow, Models for real stirred tanks.
2.	<b>Kinetics and Design for uncatalyzed Heterogeneous system:</b> Rate equation for heterogeneous reactions, Combining linear rate expressions, Combining non-linear rate equations, Contacting patterns for two-phase systems.
3.	Fluid Fluid Reactions , Rate equation, Kinetic regimes for mass transfer and reaction, Rate equations for instantaneous reactions, Fast and intermediate rate equations. Rate equation for slow reaction, Rate equation for infinitely slow reaction, film conversion parameter $M$ , Towers for fast and slow reactions, mixer settlers. Semi batch contacting patterns, Slurry reactors.
4.	Fluid particle Reactions, Selection of a model, Unreacted core models for unchanging size spherical particles, Spherical particles of changing size, Diffusion through gas film and through ash layer controlling, Chemical reaction controlling, Shrinking core model, its limitations, Determination of rate controlling step, Plug and mixed flow of unchanging size solids under uniform gas composition, particles of single size and mixture of particles of various sizes, Fluid and fixed beds with solids entrainment, instantaneous reactions.
5.	Catalysts, Physical properties of catalyst, surface area, void volume, solid density pore volume distribution, Classification and preparation of catalyst, catalyst promoters. Catalyst inhibitors, Catalyst poisons, Nature and Mechanism of Catalytic reactions.
6.	Solid catalyzed reactions rates of chemiadsorption, Adsorption isotherms and rates of adsorption and desorption. Adsorption desorption rate controlling surface reaction rate controlling, Experimental methods of finding rates, differential, integral, mixed batch and recycle reactors, determining reactor size from rate equations. Product distribution in multiple reactions.
7.	Fixed bed Reactors global reaction rates. Mass energy balance equation for fluid flowing through bed of catalyst..
8.	Slurry Reactors effect of external transport resistance on global rate of reaction,
9.	Fluid bed Reactors heat transfer and mixing in fluidized bed. <del>et</del> Bubbling bed model

#### Term Work and Practical:

Experiments based on above topics should be given to the students

#### Text Book:

- 1 Octave Levenspiel, "Chemical Reaction Engineering", 3rd Edition, John Wiley & Sons (Asia) pvt. Ltd.
- 2 J.M.Smith, "Chemical Engineering Kinetics", 2<sup>nd</sup> edition, McGraw-Hill

#### Reference Book:

- 1 H. Scott Fogler, "Elements of Chemical Reaction Engineering" 3rd Edition November, Prentice Hall of India Pvt Ltd
- 2 L. D. Schmidt, "The Engineering of Chemical Reactions", Oxford Press