I Year M.Tech. Chemical Engg., I Semester

L	T	P	TO	C
3	1	-	4	4

(CH503) REACTION ENGINEERING & REACTOR DESIGN

Objective of the Course :

The student through study of this course can understand and apply the principles of different reactions, different reactors & kinetics of chemical reactions. This course offers an in depth understanding of Non – ideal flow and also heterogeneous reaction systems and design.

UNIT - I

Non-Ideal Flow: Two- parameter models- Modeling real reactors with combination of ideal reactors, testing a model and determining its parameters.

Mixing of Fluids: Zero parameter models, segregation model, and maximum mixedness.

UNIT – II

Fluid-Particle Reactions: Application to design of various types of contacting in gas- solid operations, Development of performance equation for frequently met contacting pattern assuming uniform gas composition, application to a fluidized bed with entrainment of solid fines.

UNIT - III

Fluid-Fluid Reactions: Applications to design- Towers for fast reaction; Towers for slow reaction, Mixer- settlers (Mixed flow of both phases), semi- batch contacting patterns, Reactive distillation and extractive reactions.

Catalysis and Catalytic Reactors: Design of reactors for gas- solid reactions. Heterogeneous data analysis for reactor design, catalytic deactivation moving bed reactors, fluidized bed reactors.

UNIT - IV

External Diffusion Effects on Heterogeneous Reactions: External resistance to mass transfer.

Diffusion and reaction in porous catalysts- Diffusion and reaction in spherical Catalyst pellets, Internal effectiveness factor, Falsified kinetics,

Overall effectiveness factor, Estimation of diffusion and reaction limited regions, Mass transfer and reaction in a packed bed.

UNIT - V

Non- Isothermal Reactor Design: energy balance, non- isothermal continuous Flow, reactors at steady state, equilibrium conversion; multiple steady states-heat removed term, heat of generation, ignition- extinction curve.

TEXT BOOKS:

1. Fogler, H.S., "Elements of Chemical Reaction Engineering", Prentice Hall, New Jersey, 1986.
2. Octave Levenspiel, "Chemical Reaction Engineering", Wiley Eastern university, 3rd ed., New Delhi, 2001.