PCH106 REACTION ENGINEERING & REACTOR ANALYSIS

L	T	P	Cr
3	1	0	3.5

Course Objective:
To learn about reaction kinetics for single, multiple, isothermal, non-isothermal reactions and reactor design procedures.

Chemical Kinetics: Reaction rates, Kinetics of homogeneous reactions, Interpretation of reaction data.

Isothermal Reactor Design: Design equations for batch, Plug flow, Back-mix flow and Semi-batch reactors.

Multiple Reactions: Maximizing desired product in parallel reactions and series reactions, Solutions to complex reactions.

Steady State Non-isothermal Reactor Design: Combining material and energy balances for non-isothermal CSTR and Plug flow reactors (adiabatic and with heat exchange), Adiabatic temperature and equilibrium conversion, Optimum feed temperature, Multiple steady states, Non-isothermal multiple reactions.

Solid Catalyzed Reactions: Steps in catalytic reactions: adsorption isotherms, surface reaction, desorption rate, limiting step, Diffusion and reaction in spherical catalyst pellets, Estimation of diffusion and reaction limited regimes, Mass transfer and reaction in a packed bed, Fluidized bed and multiphase reactors.

Non-ideal Reactors: Measurement of RTD, Characteristics of RTD, RTD in ideal reactors, Reactor modeling using RTD.

Course learning outcomes (CLOs):

The students will be able to

1. solve problems involving single and multiple homogeneous reactions
2. analyze and interpret experimental data for homogenous reactions
3. solve problems involving non isothermal reactor operation and design
4. solve problems involving mass transfer with reaction in solid catalyzed reaction
5. analyze and model real reactors

Recommended Books:

1. *Fogler, H.S., Elements of Chemical Reaction Engineering, Prentice-Hall India (2003).*
2. *Levenspiel, O., Chemical Reaction Engineering, John Wiley (1991).*
3. *Froment, G.F., and Bischoff, K.G., Chemical Reactor Analysis and Design, John Wiley (2001).*
4. *Smith, J.M., Chemical Engineering Kinetics, McGraw-Hill (1981).*

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1.	MST	30
2.	EST	45
3.	Sessional (may include Assignments/Projects/Tutorials/Quizes/Lab Evaluations)	25