UG Department: **Chemical Engineering**
Course Code: **CH303** Course Name: **Chemical Reaction Engineering-II**
Credit: **4** L-T-P: **3-1-0**
Version: **1** Approved on:
Prerequisite Course: Chemical Reaction Engineering-I

Non-ideal Flow: Residence time distribution of fluids, General characteristics, Measurement of RTD, RTD in ideal reactor, Tanks-in-series model, Dispersion model, Conversion using RTD data for first order reactions.

Non-catalytic Gas-Solid Reactions: Progressive conversion model, Shrinking core model; various controlling regimes, design of gas-solid reactors.

Catalysts: Description, methods of preparation and manufacture; catalyst characterization – BET surface area, pore volume, pore size distribution.

Catalyst Reaction Kinetic Models: Physical and chemical adsorption; Determination of rate expressions using adsorption, surface reaction and desorption as rate-controlling steps.

Determination of Global Rate of Reaction: Heterogeneous laboratory reactors; Determination of rate expressions from experimental data.

Effect of Intrapellet Diffusion on Reaction Rates in Isothermal Pellets: concept of effectiveness factor, Thiele modulus, experimental determination of effectiveness factor – Weisz-Prater criteria, Non-isothermal effectiveness factor; Prater number, maximum temperature rise in a pellet, multiple steady-states in heterogeneous reactors.

Gas-Liquid Reactions: Effect of diffusion on rate of reaction, enhancement factor.

Introduction to Design of Heterogeneous Reactors: One-dimensional model for fixed-bed reactors, parametric sensitivity; design of fluidized bed reactors.

Books

1. Fogler, H. S., "*Elements of Chemical Reaction Engineering*," 3rd ed., Prentice-Hall of India, Delhi, 2003.
2. Levenspiel, O., "*Chemical Reaction Engineering*," 3rd ed., John Wiley, 1999.
3. Smith, J. M., "*Chemical Engineering Kinetics*," 3rd ed., McGraw-Hill, 1981.
4. Carberry, J. J., "*Catalytic Reaction Engineering*," McGraw-Hill, 1976.
5. Levenspiel, O., "*The Chemical Reactor Omnibook,"* OSU Bookstores, Corvallis Oregon, 1996.