BTech Bridging Unit (BBU) in Chemical Engineering
(*Introduction to Reaction Engineering)*

Objectives

- Understand basic concepts in chemical kinetics; Analyse kinetic data and rate equations
- Describe the basic characteristics of ideal batch, mixed flow and plug flow reactors
- Explain the effects of temperature on heats of reaction and yields of multiple reactions; Design non-isothermal reactors graphically
- Characterize the effects of non-ideal flows in reactor design

Description

- Chemical Kinetics – Definitions of terms. Elementary and non-elementary reactions. Stoichiometry and rate equation. Reaction orders, rate constants and molecularities. Methodologies in reaction mechanism. Temperature dependence of reaction rates. Arrhenius law
- Rate Laws- Measurements of reaction rates. Determination of rate laws. Differential and integral analysis. Parallel reactions. Series reactions. Autocatalytic reaction. Pseudo steady-state approximation. Proposal of reaction mechanisms. Enzyme kinetics and the Michaelis–Menten equation; Langmuir-Hinshelwood kinetics.
- Basics of Reactor Design – Ideal batch reactor. Steady state mixed flow reactor. Steady state plug flow reactor. Conversion. Space-time and space-velocity. Constant density and variable density systems. Stoichiometric table. Recycle reactor. Performance equations.
- Temperature Effects – Heats of reaction and temperature effect. Multiple reactions and temperature effect. General graphical design of non-isothermal reactors. Optimum temperature progression
- Basics of Non-Ideal Flow – Residence time distribution. State of aggregation and mixing. E and F curves. Pulse and step experiments. Conversion in non-ideal flow reactors

Assessment

- Tests/Quizzes: 20%
- Others (e.g. Projects, assignments, homework, class participation): 20%
- Final Examination: 60%