Department :Chemical Engineering **Division:** Chemical Engineering

Course Title : Kinetic & Reactor design

- **Aim:**

Introduction to chemical reaction kinetics and principles of chemical reactor design

- **Syllabus:**
- Batch reactor design equations
- Design equations for flow reactors
- CSTR
- Tubular flow reactor
- Packed bed reactor
- Design equations for continuous flow reactors
- Reactors in series
- CSTRs in series
- PFR in series
- Combinations of CSTR and PFR reactors in series
- Comparing CSTR and PFR raector volumes
- Definition of space time and space velocity
- Rate laws and stoichiometry
- Reaction order and rate law
- -Reaction rate constant
- Stoichiometry for batch and flow systems
- Isothermal reactor design
- Design structure for isothermal reactors
- Scale up of liquid phase batch reactor data
- Design of isothermal CSTRs
- Tubular reactors
- Pressure drop in reactors
- Mole balances on CSTRs, PFRs, PBRs and batch reactors
- Microreactors and membrane reactors
- Unsteady-state operation of stirred reactors
- Analysis of experimental data
- Multiple reactions
- Parallel reactions
- Maximizing the desired product in series reaction
- Algorithm for complex reactions
- Multiple reactions in PFR/PBR
- Reaction mechanisms
- Active intermediates and non-elementary rate laws
- Enzymatic reactions
- Bioreactors
- Steady state non-isothermal reactor design

- Unsteady-state non-isothermal reactor design
- Mole balance
- Rate of reaction
- General mole balance
- Batch reactor
- Continuous-flow reactors
- Continuous stirred tank reactors
- Tubular reactor
- Packed-bed reactor
- Industrial reactors
- Conversion and reactor sizing
- Definition of conversion

- **Reading Resources:**

1- Elements of chemical reaction engineering, 4th edt., 2006, Pearson Education International, H. S. Fogler2- Chemical reaction engineering, 3rd edt., John Wiley & Sons, 1999, O. Levenspiel