THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Advanced Kinetics I

CBE 8812

Credit Hours:
3.00 - 3.00

Course Levels:
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Chemical engineering kinetics from the viewpoint of industrial chemical processes.

Prerequisites and Co-requisites:
Prereq: 2523 (523) and 3610 (610), and Grad standing; or permission of instructor.

Course Goals / Objectives:
- Be familiar with molecular theories of homogeneous and heterogeneous reaction kinetics
- Have the ability to model and simulate non-ideal single phase flow systems with chemical reactions and multiphase flow systems with chemical reactions
- Understand how to simplify in an analysis the complex flow problems with multiple chemical reactions by considering various rate determining steps and the quasi-steady state assumptions
- Understand the state-of-the-art applications of reaction engineering in chemical, biochemical, petrochemical, pharmaceutical, energy and environmental systems

Course Topics:

- Kinetics -Stoichiometry of Reactions -Reaction Network
- Kinetics, cont. -Elementary Reactions -Molecular Theories of Chemical Kinetics -Collision Theory - Transition State Theory
- Kinetics, cont. -Methods of Simplifying A Full Model -The Quasi-Steady-State Assumption (QSSA) -The Reaction Equilibrium Assumption (REA)
- Kinetics, cont. -Kinetics of Homogeneous Reactions -Interpretation of Batch Reactor Data -Ideal Reactors for a Single Reaction -Design for Single Reactions
- Kinetics, cont. -Design for Multiple Reactions -Heterogeneous Reactions -Solid Catalyzed Reactions - Surface-Reaction Controlling -Adsorption-Rate Controlling
- Modeling and Simulation of Flow Systems and Chemical Reactors Kinetics -Flow Patterns for Non-ideal Flows -Non-Ideal Flow Models -Residence Time Distribution
- Modeling and Simulation of Flow Systems and Chemical Reactors Kinetics, cont. -Density Function -Pulse Experiment -Step Experiment -Laplace Transform
- Non-ideal Reactors and Multiphase Reaction Engineering -Packed Bed Catalytic Reactor -Continuous Gas/Liquid contactors
- Non-ideal Reactors and Multiphase Reaction Engineering, cont. -Reactors with Suspended solid Catalyst, Fluidized Reactors of Various Types -Gas-Liquid Reactions on Solid Catalyst: Trickle Beds, Slurry Reactors, Three-Phased Fluidized Beds
- Modeling and Simulation of Flow Systems and Chemical Reactors Kinetics, cont. -State of Aggregation - Earliness and Lateness of Mixing -State of Macro-Mixing
- Modeling and Simulation of Flow Systems and Chemical Reactors Kinetics, cont. -State of Micro-Mixing - Laminar Flow Reactor (LFR)
- Modeling and Simulation of Flow Systems and Chemical Reactors Kinetics, cont. -Recycle Reactor -Tanks-in Series MOdel -Dispersion Model
- Chemical Looping Systems Applied to Energy and Enviromental Reaction Engineering -Combustion Systems -Gasification Systems -Chemicals (e.g., maleic anhydride) and Energy (hydtrogen and liquid fuels) Production

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Designation:
Elective
Required