

06-364 Chemical Reaction Engineering

February 3, 2014

Course Description

Fundamental concepts in the kinetic modeling of chemical reactions, the treatment and analysis of rate data. Multiple reactions and reaction mechanisms. Analysis and design of ideal and non-ideal reactor systems. Energy effects and mass transfer in reactor systems. Introductory principles in heterogeneous catalysis.

Required: True

Prerequisites: 06-321, 06-323, 09-347

Textbook: H. S. Fogler, Elements of Chemical Reaction Engineering, 4th edition, Prentice Hall, New York, 2006.

1 Course goals

1. To understand the importance of selectivity and know the strategies that are commonly used in maximizing yields
2. To effectively use mathematical software in the design of reactors and analysis of data
3. To choose a reactor and determine its size for a given application
4. To work with mass and energy balances in the design of non-isothermal reactors
5. To develop a mechanism that is consistent with an experimental rate law
6. To understand the behavior of different reactor types when they are used either individually or in combination
7. To analyze kinetic data and obtain rate laws

2 Topics

- Conversion and reactor sizing
- Rate laws and stoichiometry

- Isothermal reactor design
- Collection and analysis of rate data
- Multiple reactions and selectivity
- Non-elementary reaction kinetics
- Non-isothermal reactor design
- Unsteady operation of reactors
- Catalysis and catalytic reactors