

CME 323 Reaction Engineering and Chemical Kinetics

Credits and Contact Hours: 3 credits; 2 hours and 30 minutes per week

Course Instructor: Yizhi Meng

Text(s): *of Chemical Reaction Engineering, 4th ed. (2006)* by H. Scott Fogler, Prentice Hall

Specific course information

a. The objective of this course is to introduce students to the fundamentals of chemical kinetics for homogeneous and heterogeneous reactions, both catalyzed and uncatalyzed. Steady-state approximation, methods of kinetic data collection, analysis and interpretation will be discussed. Transport effects in solid and slurry-phase reactions, batch and flow reactors including operations under non-ideal and non-isothermal conditions will be covered. Reactor design will be emphasized including bioreactors.

b. U3 standing in CME, CME 312, CME 314

c. required

Specific goals for the course:

a. specific outcomes of instruction

At the end of this course, students will be able to:

- Determine rate laws from kinetic data
- Apply ideal reactor models
- Analyze the performance of reactors in which multiple reactions are occurring
- Analyze nonideal flow conditions in reactors and to utilize simple models to characterize the performance of such reactors
- Analyze data for heterogeneous catalytic reactions and to design simple reactors based on these analyses

b. explicitly indicate which of the student outcomes listed in criterion 3 or any other outcomes are addressed by the course.

b. Criterion 3 a-k: Outcomes	% contribution
a. Ability to apply knowledge of math, engineering, and science	20%
b1. Ability to design and conduct experiments	15%
b2. Ability to analyze and interpret data	15%
c. Ability to design system, component or process to meet needs	10%
d. Ability to function on multi-disciplinary teams	10%
e. Ability to identify, formulate, and solve engineering problems	15%
k. Ability to use techniques, skills, and tools in engineering practice	15%
Any other outcomes and assessments?	100%

Brief list of topics to be covered (including exams/quizzes):

Week 1: Introduction, mole balances

Week 2: Conversion in ideal reactors

Week3: Rate laws part I

Week4: Rate laws part II

Week 5: Stoichiometry

Week 6: Quiz 1; Reactors Part I

Week 7: Reactors Part II

Week 8: Review, Midterm

Week 9: Catalysis

Week 10: (SPRING RECESS)

Week 11: Multiple reactions, bioreactors

Week 12: Quiz 2; Nonisothermal reactors

Week 13: Unsteady-state operation

Week 14: Quiz 3; Diffusion effects

Week 15: Residence time distributions, non-ideal reactors; final exam