CME 323 Reaction Engineering and Chemical Kinetics

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

Course Instructor: Yizhi Meng


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. Criterion 3 a-k: Outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>% contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Ability to apply knowledge of math, engineering, and science</td>
<td>20%</td>
</tr>
<tr>
<td>b1. Ability to design and conduct experiments</td>
<td>15%</td>
</tr>
<tr>
<td>b2. Ability to analyze and interpret data</td>
<td>15%</td>
</tr>
<tr>
<td>c. Ability to design system, component or process to meet needs</td>
<td>10%</td>
</tr>
<tr>
<td>d. Ability to function on multi-disciplinary teams</td>
<td>10%</td>
</tr>
<tr>
<td>e. Ability to identify, formulate, and solve engineering problems</td>
<td>15%</td>
</tr>
<tr>
<td>k. Ability to use techniques, skills, and tools in engineering practice</td>
<td>15%</td>
</tr>
<tr>
<td>Any other outcomes and assessments?</td>
<td>100%</td>
</tr>
</tbody>
</table>
Brief list of topics to be covered (including exams/quizzes):

Week 1: Introduction, mole balances
Week 2: Conversion in ideal reactors
Week 3: Rate laws part I
Week 4: 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