CME 323 Reaction Engineering and Chemical Kinetics (Required)

Course Instructor: *Dr. Nadine Pernodet*

Website: none

Course Goals:

Introduction to chemical reaction engineering and reactor design. Fundamentals of chemical kinetics for homogeneous and heterogeneous reactions, both catalyzed and uncatalyzed. Steady-state approximation. Methods of kinetic data collection, analysis and interpretation. Transport effects in solid and slurry-phase reactions. Batch and flow reactors including operations under non-ideal and non-isothermal conditions. Reactor design including bioreactors.. [3 credits]

Pre- or Corequisite(s): U3 standing in CME, CME 312, CME 314

Text(s): *Charles G. Hill, Introduction to Chemical Engineering Kinetics and Reactor Design, 1st ed., 1999. John Wiley & Sons.*
O. Levenspiel. Chemical Reaction Engineering, 3rd ed., 1998 John Wiley & Sons

Class/ Laboratory Schedule:

Spring: Lecture, Tuesday/Thursday 11:20-12:40 pm

Topics Covered:

Week 1: Reaction systems; homogeneous

Week 2: Reaction systems: heterogeneous including slurry-phase

Week 3: Reaction Kinetics: Reaction rates and equilibrium compositions

Week 4: Rate equations and stoichiometry. Steady state

Week 5: Transport effects: Stefan-Maxwell Diffusion Equation for external transport, Internal transport and Knudsen diffusion. Quiz 1

Week 6: Catalysis: Asymmetric hydrogenation of olefins, ethylene hydrogenation

Week 7: Kinetics analysis of catalytic reactions

Week 8: Review/Make up/Mid-term

Week 9: Reactor types and characteristics, reactor safety during operation

Week 10: Thermal characteristics of reactors: adiabatic, steady state

Week 11: Non-ideal flow reactors: dispersion model, conversion prediction, residence time distribution Quiz 2

Week 12: Non-isothermal reactors: temperature effects and energy balances

Week 13: Slurry-phase reactors: application in modern-day processes

Week 14: Introduction to bioreactors

Week 15: Review, Make-up, final exam

Contribution of course to meet professional component:

Relationship of course to program outcomes:

CTPC "3a-k" Outcomes	% contribution
A. Ability to apply knowledge of math, engineering, and science	9%
B. Ability to design and conduct experiments, analyze data	40%
C. Ability to design system, component or process to meet needs	27%
D. Ability to function on multi-disciplinary teams	
E. Ability to identify, formulate, and solve engineering problems	10%
F. Understanding of professional and ethical responsibility	5%
G. Ability to communicate effectively	
H. Broad education	2%
I. Recognition of need an ability to engage in life-long learning	2%
J. Knowledge of contemporary issues	2%
K. Ability to use techniques, skills, and tools in engineering practice	3%
Any other outcomes and assessments?	
	100%

Prepared by _____

Date Prepared: _____