

Chemical Reaction Engineering (CBE 40445)

University of Notre Dame, Fall Semester 2006

Prof. Bill Schneider
office: 123b Cushing
wschneider@nd.edu, phone 631-8754

Classroom: 311 DBRT
Lecture MWF 10:40 – 11:30
Recitation F 1:55, 320 DBRT

Chemical reaction engineering is “*par excellence* the domain of the chemical engineer” (R. Aris)—the analysis and design of chemical reactors (big and small) to economically produce useful products. Reaction engineering ties together virtually all elements of Chemical Engineering, from thermodynamics and chemical kinetics to mass and energy balances to mass and heat transfer. We will approach this from an analytic perspective, starting from fundamental reaction fundamentals and building to design of multiphase reactors.

I strongly encourage you to keep up with the reading and homework and to feel free to bring up questions in class. Don't be bashful: if you don't understand something, chances are that many of your classmates (and quite possibly your instructor!) don't either.

Text: *The Engineering of Chemical Reactions*, 2nd ed., L. D. Schmidt, Oxford 2005
Also see: *Chemical Engineering Kinetics and Reactor Design*, C. G. Hill, Wiley 1977 (desk reserve)
Elementary Chemical Reactor Analysis, R. Aris, Butterworth, 1989.

Topics:	Introduction	Preface & Ch. 1
	Matlab Review	
	Chemical Reactions, Rates, and Stoichiometry	Chapter 2
	Chemical Thermodynamics and Equilibria	Chapter 2
	Applied Chemical Kinetics and the Batch Reactor	Chapter 2
	Fundamentals of Chemical Kinetics	Chapter 2 & 4
	Isothermal Continuous Reactors – PFR	Chapter 3
	Isothermal Continuous Reactors – CSTR	Chapter 3
	Multiple Reactions and Selectivity	Chapter 4
	Steady-State Non-Isothermal Reactors	Chapter 5
	Unsteady-State Non-Isothermal Reactors	Chapter 6
	Catalysis & Surface Chemistry	Chapter 7
	Catalytic Reactors & Mass Transfer	Chapter 7
	Non-ideal Chemical Reactors	Chapter 8
	Multiphase Reactors	Chapter 12

Format: The topics will be presented in a series of self-contained lectures. Each lecture will include some suggested problems from the book to give you practice with the material. Matlab files will be available that illustrate some of the calculations discussed in lecture.

Homework: Twelve graded problem sets will be distributed during the term and will be due at the beginning of class on dates to be announced. ***Assignments turned in late will automatically lose 20%, and those turned in after the solutions are posted will not be accepted.*** Your two lowest scores on homework will be dropped. You are encouraged to use Matlab as an aid in problem solution. You may discuss the homework with your classmates, but ***what you turn in must be your own work.*** To assure this, each week three people will be chosen randomly to meet with me one-on-one to defend their homework answers.

Exams: We will have three in-class exams and a cumulative final. One two-sided sheet of paper can be brought to the exam as an aid.

Exam 1, Friday, Sept. 22

Exam 2, Friday, Oct. 13

Exam 3, Friday, Nov. 10

Grading: Grades will be based on the homework (30%), three in-class exams (40%), and a cumulative final (30%).

Academic honesty: Should go without saying. Any cheating or misrepresenting of work as your own will be dealt with according to the policies of the university.

Office hours: The TAs and I will make ourselves available to answer questions outside of class:

Victoria Froude

vfroude@nd.edu

W 5 – 7 pm

Fitzpatrick TBD

Hangyao Wang

Hwang4@nd.edu

Th 8 – 10 pm

A67B Fitzpatrick

Bill Schneider

Wschnei1@nd.edu

F 3 – 4:30 pm

123B Cushing

Class schedule: Class meets MWF at 10:40, and recitation is scheduled on Fridays at 1:55. Due to Prof. Schneider's conference commitments, some lectures during the term will be rescheduled to recitation periods. The semester lecture and exam schedule is as indicated below.

Week	Monday	Wednesday	Friday
1 (Aug. 21)		1	2
2 (Aug. 28)	3	4	5 & 6
3 (Sep. 4)	7	8	9
4 (Sep. 11)	No class	No class	10 & 11
5 (Sep. 18)	12	13	Exam 1
6 (Sep. 25)	14	15	16
7 (Oct. 2)	17	18	19 & 20
8 (Oct. 9)	21	22	Exam 2
9 (Oct. 16)	Fall Break!	Fall Break!	Fall Break!
10 (Oct. 23)	23	24	25 & 26
11 (Oct. 30)	27	28	29 & 30
12 (Nov. 6)	31	32	Exam 3
13 (Nov. 13)	SF AIChE!	SF AIChE!	SF AIChE!
14 (Nov. 20)	33	34	Thanksgiving
15 (Nov. 27)	35	36	37
16 (Dec. 4)	38	39	