ChEE 420/520: Chemical Reaction Engineering
---------- Bldg. (Room ----); Day(s) Time (Fall 20XX)

Instructor
Prof. Suchol Savagatrup
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Office hour:
Wednesday, 4 – 6 pm, Harshbarger 132
Or by appointments

Teaching Assistant

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Day, Time, Location

Prerequisites
CHEE 201, CHEE 326, MATH 254

Required Textbook
Elements of Chemical Reaction Engineering, H. Scott Fogler, 4th or 5th Edition
(Any edition will work. Available at the UA BookStores and on Amazon)

Description of Course
Study and apply the fundamental principles of chemical reaction engineering to design and analyze basic chemical reactors that contain both homogeneous and heterogeneous reactions.

Course Objectives
At the completion of this course, students are expected to be knowledgeable and experienced with the following:

1. Chemical reactor design equations under both isothermal and non-isothermal conditions
2. Analysis of reaction rate data
3. Multiple reaction scenarios
4. Reaction mechanisms
5. Catalysis and heterogeneous reaction mechanisms

Course Format and Teaching Methods
Lecture format

Course Communications
Official UA email address and/or D2L

Homework
Homework will be assigned on D2L on Thursdays and will be due on the following Thursday, unless indicated otherwise. See schedule below for details. A PDF file of a clear scan or a clear picture from your device should be uploaded to the D2L Dropbox **before** 8 am on the due date. Late homework will not be corrected and will receive a score of zero. There will be nine homework assignments. They will count for 10% of the total grade. Solutions will be posted on D2L after the due date. Students should feel free to discuss the assignments with others; **however, the final product must be entirely your own work**.

Examinations
There will be two in-class exams. Each will count for 25% of the total grade. See schedule below for details.

- In-class exams will be **open book/notes** and **75 minutes long**. You may use a calculator. No other electronic equipment will be allowed.
- Make-up exams may be arranged if you notify the instructor before the regularly scheduled exam. A makeup exam will be scheduled only if the student has a valid reason for missing the regularly scheduled exam.

Design Project

The design project will be assigned two weeks prior to the due date. See schedule below. You will be tasked to solve series of questions in designing reactors using the tools you will learn from this class. You may use any resource available to you. Similar to homework assignments, you are free to consult with others as long as **the final product is entirely your own work.** A PDF file should be uploaded to D2L Dropbox **before** 8 am on the due date.

Final Examinations

The final exam will be in-class, **open book/notes**, and **2 hours long**. You may use a calculator. No other electronics equipment will be allowed.

Grading Scale

The course grade will be determined by the following graded elements:

Homework	10%
Exam 1 (in-class)	25%
Exam 2 (in-class)	25%
Design Project	10%
Final Exam	30%

I will use two methods to compute the course grade, and **you will receive the higher of the two grades** as the final course grade. Graduate students taking ChEE 520 for graduate credit should speak to the instructor about how the course experience will vary for them.

1. **Straight scale**: I will assign letter grades based on an absolute percentage of points earned in the course.
2. **Curved scale**: I will rank the class from top to bottom using the total point earned and distributed 20% As, 30% Bs, 30% Cs, 15% Ds, and 5% Es.

	Straight Scale	**Curved Scale**
A	90 – 100	$>80^{th}$ percentile
B	80 – 89	50^{th} – 79^{th} percentile
C	70 – 79	20^{th} – 49^{th} percentile
D	60 – 69	5^{th} – 19^{th} percentile
E	< 60	$< 5^{th}$ percentile

Scheduled Topics/Activities

Date	Lecture #	Topic	Ch. (4th)	Ch. (5th)	Assign	Due
---	1	Syllabus, introduction to CRE, materials balances, reaction rate	1	1		
---	2	Basic types of reactors, reactor design equations	1	1	HW1	
---	3	Reactor design for single reactions, multiple reactors	2	2		
---	4	Chemical kinetics, reaction rate laws	3	3	HW2	HW1
---	5	Stoichiometry	3	4		
---	6	Isothermal reactor design, reactors in series	4	5	HW3	HW2
---	7	Pressure drops in reactor	4	5		
---	8	Semi-batch, recycle, membrane reactors	4	6	HW4	HW3
---	9	Analysis of rate data using differential / integral method	5	7		
---	10	Continue analysis of rate data, review	5	7		HW4
---	—	**Midterm Exam 1**				
---	11	Multiple reactions	6	8	HW5	
---	12	Multiple reactions	6	8		
---	13	Reactor energy balance	8	11	HW6	HW5
---	14	Reactor energy balance	8	11		
---	15	Non-isothermal reactor design, adiabatic reactors	8	11	HW7	HW6
---	16	Non-isothermal reactor design, adiabatic reactors	8	11		
---	17	Non-isothermal reactor design, flow reactors	8	12	HW8	HW7
---	18	Non-isothermal reactor design, flow reactors	8	12		
---	19	Multiple steady states; reactor stability, thermal runaway	8	12		HW8
---	20	Review				
---	—	**Midterm Exam 2**				
---	21	Unsteady state non-isothermal reactor design	9	13		
---	22	Unsteady state non-isothermal reactor design	9	13	HW9	
---	23	Reaction Mechanism, homogeneous reactions	7	9		
---	24	Reaction Mechanism, enzymatic reaction	7	9	**Design**	HW9
---	25	Catalysis and catalytic reactors	10	10		
---	—	**Thanksgiving**				
---	26	Catalysis and catalytic reactors	10	10		
---	27	Special topics				**Design**
---	28	Review				
---	—	**Final Exam**				