Prairie View A&M University
Chemical Engineering Department
CHEG 3063-P02: Kinetics and Reactor Design
Spring 2019 Syllabus

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Office Hours: M: 2:00-4:30 pm; W: 8:00 am- 12:00 pm; R: 8:00-10:30 am

COURSE

Meeting Time: TR 11:00 - 12:20 p.m.
Location: Wilson 103
Prerequisites: CHEG 2053, MATH 4013, and CHEG 3053
Recommend Text: Fogler, H. S., Elements of Chemical Reaction Engineering, Prentice-Hall, (5th Edition).
Evaluation: This course will utilize the following instruments to determine student grades and proficiency of the learning outcomes for the course. The course has been designed to ensure that students acquire a solid grounding in ABET Outcomes **2**
Description: Application of fundamental concepts of reaction stoichiometry, kinetics, and equilibria to the interpretation of reaction rate data. Application of reaction rate, heat, and mass transfer correlations to the design of batch, continuous tank, and tubular reactors.
Goals: The goal of this course is to teach students the science and design of reaction engineering processes.
Outcomes: The student will have demonstrated the ability to:

1. Apply conservation laws.
2. Solve complex reaction engineering problems.
3. Design complex chemical reactors using modern calculation tools and techniques.

GRADING POLICY

Item	Points
Tests (2)	300
Homework/Computer	200
Quiz	100
Final	200
Project	200

		Points
Grade Scale:	A =	1000 - 900
	B =	899 - 800
	C =	799 - 700
	D =	699 - 600
	F =	< 600

Tests: Two closed book exams will be given during the semester. The final exam is also closed book. Make-up exams will be given only to students who have a university excuse and who have discussed the situation with the instructor. Make-ups are always given **BEFORE** the regularly scheduled exam.
Homework: Five homework/computer assignments are scheduled. No late assignments will be accepted. Each assignment must be submitted on engineering paper that can be purchased at the bookstore or other retailers. Copying of assignments will not be allowed. Individuals associated with the sharing of solutions will be given a zero and referred to the department head. Homework assignments will cover Excel and Polymath.
Quiz: Three closed book quizzes will be given throughout the semester to access performance. Quizzes will be based on material covered in class and homework assignments. Additional quizzes may occur in eCourses due to travel schedules.
Participation: Class time is an opportunity for the students to learn the material being covered NOT time for socializing. All students are expected to participate in class discussions and activities. Moreover, it is university policy that all students attend class regularly.
Project: Group projects will be discussed at a later time.
Software: Students are **required** to download Polymath which is also available in computer lab.

TENTATIVE LECTURE SCHEDULE

Week	Lecture Topic	Suggested Practice Problems	No. of lectures	Grades
1	Review of syllabus; Chapter 1: Mole Balances		2 lectures	
2	Chapter 2: Conversion and Reactor Sizing		2 lectures	Q1
3	Chapter 3 and 4: Rate Laws and Stoichiometry ***Begin Reports/Pick Groups***		2 lectures	H1
4	Chapter 3 and 4: Rate Laws and Stoichiometry		2 lectures	CA1
5	Chapter 5: Isothermal Reactor Design		2 lectures	H2, Q2
6	Chapter 6: Isothermal Reactor Design		2 lectures	H3
7	Chapter 6: Isothermal Reactor Design ***Exam I on Ch. 1 - 6*** ***Thursday, February 28, 2019***		1 lecture	E1
8	Chapter 8: Multiple Reactions		2 lectures	
9	SPRING BREAK			
10	Chapter 9: Reaction Mechanisms, Pathways, Bioreactions, and Bioreactors		2 lecture	H4
11	Chapter 10: Catalysis and Catalytic Reactors		2 lectures	Q3
12	***AIChE Spring Meeting*** Online Videos with Quiz Energy Balances		1 lecture	CA2
13	Chapter 11 and 12: Nonisothermal Reactor Design		2 lectures	H5
14	Chapter 11 and 12: Nonisothermal Reactor Design ***Exam II on Ch. 8 – 12*** ***Thursday, April 18, 2019***		1 lecture	E2
15	***Design Presentations***			
16	Review Day Final Exam: ***Thursday, May 2, 2019*** ***10:30 a.m. – 12:30 p.m.***			FE

**This schedule represents a tentative schedule only and is subject to change at the instructor's discretion.*

CONDUCT

- Students will conduct themselves in a manner that is respectful to their fellow classmates and the instructor at all times.
- **Cell phones MUST be turned off and stored during class time.**
- Students will arrive to class prepared to discuss and participate in the lesson. Students should dress appropriately for class.
- Students who disrupt class will be asked to leave. No sleeping allowed!
- No headphones are allowed during class including quizzes and exams.

UNIVERSITY RULES AND PROCEDURES

Disability statement (See Student Handbook)

Students with disabilities, including learning disabilities, who wish to request accommodations in class should register with the Services for Students with Disabilities (SSD) early in the semester so that appropriate arrangements may be made. In accordance with federal laws, a student requesting special accommodations must provide documentation of their disability to the SSD coordinator.

Academic misconduct (See Student Handbook)

You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with your Student Handbook, especially the section on academic misconduct. Students who engage in academic misconduct are subject to university disciplinary procedures.

Forms of academic dishonesty

1. Cheating: deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the instructor on assignments or examinations.
2. Academic misconduct: tampering with grades or taking part in obtaining or distributing any part of a scheduled test.
3. Fabrication: use of invented information or falsified research.
4. Plagiarism: unacknowledged quotation and/or paraphrase of someone else's words, ideas, or data as one's own in work submitted for credit. Failure to identify information or essays from the Internet and submitting them as one's own work also constitutes plagiarism.

Nonacademic misconduct (See Student Handbook)

The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either (1) the instructor's ability to conduct the class, (2) the inability of other students to profit from the instructional program, or (3) campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under nonacademic procedures.

Sexual misconduct (See Student Handbook)

Sexual harassment of students and employers at Prairie View A&M University is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action.

Attendance Policy

Prairie View A&M University requires regular class attendance. Excessive absences will result in lowered grades. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in assignment of a grade of "F". Absences are accumulated beginning with the first day of class.

Student Academic Appeals Process

Authority and responsibility for assigning grades to students rests with the faculty. However, in those instances where students believe that miscommunication, errors, or unfairness of any kind may have adversely affected the instructor's assessment of their academic performance, the student has a right to appeal by the procedure listed in the Undergraduate Catalog and by doing so within thirty days of receiving the grade or experiencing any other problematic academic event that prompted the complaint.

COURSE OUTCOMES

Three major course outcomes will be assessed in this course using a number of performance criteria. The Course outcomes and their performance criteria are detailed below:

Course Outcome 1: This outcome is the same as program outcome 2.
Students will have the ability to design a system, a component, or a process to meet desired need within constraints.

The two performance criteria used to assess this outcome consist of

1. Ability to apply conservation laws.

Students are able to:

(i) Identify the limiting reactant, basis of calculation, and excess reactants.
(ii) Apply stoichiometric ratios or relative rates and develop a stoichiometric table based on phase and components.
(iii) Perform mole balances and energy balances based on chemical reaction and/or reactor type.
(iv) Understand reaction mechanisms and reaction pathways.
(v) Derive mole balance equation for various reactors.

2. Ability to design complex chemical reactors using modern calculation tools and techniques.

Students are able to:

(i) Identify the types needed or being utilized based on phase and components.
(ii) Identify the types of reactors needed for the project.
(iii) Determine reactor volume/length and catalyst weight.
(iv) Calculation conversion or concentration of components entering and leaving reactor.
(v) Meet design constraints given in the problem statement.
(vi) Utilize computer software such as Excel, Aspen, Polymath and Hysys to create models and performance charts.
(vii) Design for the control of runaway reactions.
(viii) Select relief valves and other safety apparatus.
(ix) Read and utilize MSDS sheets.
(x) Recognize the importance for safety in industry and laboratory settings.
(xi) Determine the risk associated with gas releases from reactors.

3. Ability to solve complex reaction engineering problems.

Given a problem, the student is able to:

(i) Combine rate laws, mole balances, and stoichiometry to solve for volume, concentration, or flow rate.
(ii) Determine the final exit concentration using Excel.
(iii) Calculate reactor volume using approximations.
(iv) Calculate pressure drops across tubular reactors.
(v) Calculate conversion and concentration.
(vi) Evaluate the selectivity of products in reactions.
(vii) Calculate the optimum conversion.
(viii) Increase desired product for single and multiple reactants by selecting appropriate reactor and feed conditions.
(ix) Research common safety procedures utilized with different catalytic reactions.