Department of Chemical Engineering

Course Syllabus

Course Code & Number	CHE 308		
Course Title	Kinetics and Reactor Design		
Credit & Contact Hours	4 Credits; 3 Lectures, 3 Laboratories (3-3-4)		
Instructor	Dr. Muhammad Naveed Khan		
Office Location	Room# 2320		
Instructor's Office Phone	00966 13 720 5178		
Instructor's Email	muhkhan@uhb.edu.sa	**Homepage link**	*https://www.uhb.edu.sa/Pages/MemberDetails.aspx?Param=college&Ref=29&Member=429*
Prerequisites	CHE 203		
Course Description	Introduction to kinetics of reactions. Techniques for experimentally determining rate laws for simple and complex chemical reactions. Design and operation of isothermal batch and flow reactors. Non-isothermal reactor design and operation. Introduction to catalysis and catalytic reactors. Relevant experiments (CSTR, Tubular Reactor, Batch Reactor; Temperature, Flow rate and Level Control, Dynamics of Stirred Tanks, Time Constants of Thermocouples)		
Course Objectives	i. Apply the fundamental principles of chemical kinetics to problems involving mass and energy balances with reactions. ii. Assess the basics of homogenous reaction kinetics and design different types of isothermal and non-isothermal chemical reactors (BR, PFR, PBR, CSTR). iii. Analyze experimental kinetic data to determine rate equations and mechanisms. iv. Use different methods to analyze rate data. v. Define catalysis and different types of catalytic reactors. vi. Apply the fundamental principles of chemical kinetics to problems involving mass and energy balances with reactions.		
Required Textbook	Fogler, H. S.. "Elements of Chemical Reaction Engineering" 3rd Edition, Prentice Hall . Levenspiel, O "Chemical Reaction Engineering", 3rd edition, John Willey and Sons.		

Grading Scheme

Assessments	Assessments Task	Week due	Proportion of Final Mark (%)
1	Quizzes	fortnightly	10
2	Home-works	fortnightly	10
3	Midterm exam	7	20
4	Lab Reports	Every week	10
5	Lab Midterm	8	10
6	Lab Final	12	10
7	Final exam	13	30

Course Learning Outcomes & Mapped So's

1. To interpret batch and differential reactors data to obtain reaction rate expressions. (ABET Outcome 1)
2. To define catalysis, classify catalytic reaction and describe its steps (ABET Outcome 1)
3. To calculate yield and selectivity in multiple reactions. (ABET Outcome 1)
4. To calculate volume of batch and flow reactors in constant- and variable-volume systems. (ABET Outcome 1)
5. To analyze heat effects in non-isothermal reactors (ABET Outcome 1)
6. To conduct experiments, analyze and interpret experimental data (ABET Outcome 6)
7. To calculate catalyst weight and reactor volume and to design isothermal packed-bed reactors (ABET Outcome 1)

Attendance

	Number of unexcused absences			Tot Absences (excused* + unexcused)
	Warning I	Warning II	DN	DN
3 Hours / Week (45 Hours Total)	4 Hours (8%)	8 Hours (17%)	11 Hours (25%)	15 Hours (33%)
Laboratory session	NA	NA	NA	NA

Topics		Week.	Topic Covered
		1-4	Rate Laws, Stoichiometry and Mole Balances
			Conversion and Reactor Sizing
		5-9	Isothermal Reactor Design
			Collection and Analysis of Rate Data
			Multiple Reactions
		10-12	Non-Isothermal Reactor Design
			Catalysis and Catalytic Reactors