



**Ahmedabad
University**

Course	CHE311 Chemical Reaction Engineering-I	Semester	Monsoon Semester 2024							
Faculty Name(s)	Deepak Kunzru	Contact	deepak.kunzru@ahduni.edu.in							
School	SEAS	Credits	2							
GER Category:		Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP							
Schedule	<table> <tr> <td rowspan="2">Section 1</td><td>10:00 am to 11:00 am</td><td>Mon</td><td>01-08-24 to 26-11-24</td></tr> <tr> <td>10:00 am to 11:00 am</td><td>Fri</td><td>01-08-24 to 26-11-24</td></tr> </table>			Section 1	10:00 am to 11:00 am	Mon	01-08-24 to 26-11-24	10:00 am to 11:00 am	Fri	01-08-24 to 26-11-24
Section 1	10:00 am to 11:00 am	Mon	01-08-24 to 26-11-24							
	10:00 am to 11:00 am	Fri	01-08-24 to 26-11-24							
Prerequisite	CHE221 Thermodynamics - II									
Antirequisite	Not Applicable									
Corequisite	Not Applicable									
Course Description	This course will cover the principles involved in the selection and design of chemical reactors for homogeneous reactions.									
Course Objectives	<p>To teach methods for:</p> <ul style="list-style-type: none"> • Determining the kinetics of a reaction. • Selection of a suitable reactor for a process. • Design of ideal batch and continuous reactors for single and multiple reactions. 									

Learning Outcomes	<p>At the end of the course, the student should be able to:</p> <ul style="list-style-type: none"> • Determine the kinetics of a reaction from given rate data. • Select a suitable reactor for a given application. • Size the reactor and determine the heat duty by making mass and energy balances.
Pedagogy	Lectures and discussion.
Expectation From Students	Should be regular in classes, read the reading assignments and solve the given home assignments regularly and independently .
Assessment/Evaluation	<ul style="list-style-type: none"> • Mid-Semester Examination: <ul style="list-style-type: none"> ◦ Mid semester exam - 25% • End Semester Examination: <ul style="list-style-type: none"> ◦ Final Exam - 35% • Other Components: <ul style="list-style-type: none"> ◦ Project - 15% ◦ Quiz - 15% ◦ Assignment - 10%
Attendance Policy	As per Ahmedabad University Policy.
Project / Assignment Details	<p>Regular assignments will be given during the course of the semester.</p> <p>A term project will be assigned to each group of 2-3 students.</p>
Course Material	<p>Text Book(s)</p> <ul style="list-style-type: none"> • Elements of Chemical Reaction Engineering, H.Scott Fogler, 4th Edition, Phi Learning, New Delhi, ISBN: 9789332549326, Year: 2015, • Elements of Chemical Reaction Engineering, H.Scott Fogler, 4th Edition, Phi Learning, New Delhi, ISBN: 9789332549326, Year: 2015, • Elements of Chemical Reaction Engineering, H.Scott Fogler, 4th Edition, Phi Learning, New Delhi, ISBN: 9789332549326, Year: 2015, <p>Reference Book</p> <ul style="list-style-type: none"> • Chemical Reaction Engineering, Octave Levenspiel, Third Edition Edition, Wiley India Ltd., ISBN: 978-81-265-1000-9, Year: 2017,
Additional Information	

Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Introduction	Definition of rate of reaction; types of reactors; industrial reactions and reactors.	Fogler:pp1-8;21-24	Lecture	
2	Basic concepts in chemical kinetics	Reaction rate constant; reaction order; rate laws,elementary and nonelementary reactions.	Fogler:pp79-98	Lecture + discussion	
3	Collection and analysis of rate data	Differential method of kinetic analysis.	Fogler:pp 253-266	Lecture + discussion	
4	Collection and analysis of rate data	Integral method of kinetic analysis	Fogler:pp267-271	Lecture; Assignment 1 due	
5	Collection and analysis of rate data	Method of initial rates; method of half-lives.	Fogler:pp277-290	Lecture + discussion	
6	Isothermal reactor design	Design equations for batch and continuous reactors	Fogler:pp 37-45	Lecture + discussion	
7	Isothermal reactor design	Stoichiometric tables	Fogler: pp 99-123	Lecture+ discussion	
8	Isothermal reactor design	Designing CSTRs	Fogler:pp54-69.	Lecture; Assignment 2 due	
9	Isothermal reactors	Designing CSTRs (contd.)	Fogler:pp156-168	Lecture + discussion	
10	Isothermal reactors	Designing PFRs	Fogler: pp 168-177	Lecture+discussion	
11	Isothermal reactors	Designing PFRs (contd.)	Fogler: pp 198-214	Lecture+discussion	

12	Nonelementary homogeneous reactions	Reaction mechanisms; pseudo-steady state hypothesis.	Fogler:pp377-384	Lecture;Assignment 3 due	
13	Nonelementary homogeneous reactions	Chain reactions	Fogler:pp384-391	Lecture + discussion	
14	Multiple reactions in isothermal reactors	Mass balances; selectivity and yield; parallel reactions	Fogler: pp305-320	Lecture + discussion	
15	Midterm				
16	Multiple reactions in isothermal reactors	Series reaction; complex reactions.	Fogler: pp320-334	Lecture + discussion	
17	Multiple reactions in isothermal reactors	Best operating conditions for multiple reactions.	Fogler: pp335-351	Lecture+ discussion	
18	Steady state nonisothermal reactor design	Energy balance in CSTRS	Fogler : pp472-479	Lecture; Assignment 4 due	
19	Steady state nonisothermal reactor design	Energy balance in PFRS	Fogler : pp480-485	Lecture + discussion	
20	Steady state nonisothermal reactor design	Adiabatic reactors	Fogler:pp486-495	Lecture+discussion	
21	Steady state nonisothermal reactor design	Nonadiabatic tubular reactors and CSTRs	Fogler: pp495-520	Lecture+ discussion	
22	Steady state nonisothermal reactor design	Multiple steady states in a CSTR	Fogler pp 533-542	Lecture+ discussion; Assignment 5 due	

23	Steady state nonisothermal reactor design	Nonisothermal multiple reactions in PFRs and CSTRs	Fogler:pp543-551	Lecture+ discussion	
24	Unsteady state energy balance	Energy balance in batch reactors	Fogler:pp591-599	Lecture+ discussion	
25	Unsteady state energy balance	Energy balance in batch reactors (contd.)	Fogler:pp600-605	Lecture+ discussion	
26	Unsteady state energy balance	Energy balance in semi-batch reactors	Fogler:pp614-619	Lecture+ discussion; Assignment 6 due	
27	Introduction to nonideal reactors	Residence time distribution; RTD of ideal reactors; troubleshooting using RTD	Fogler:pp867-878;885-892		
28	Review				
29	Reflections				
30	Final Exam				

