

BS Chemistry Semester-IV					
Programme	BS Chemistry	Course Code	CHEM-201	Credit Hours	2
Course Title	Chemical Kinetics		Course Type	Major	
Course Introduction					
<p>This course covers the principles of chemical kinetics, including rate laws, reaction orders, and third-order reactions. Students will study the kinetics of various reactions, the effect of temperature, and the mathematical treatments of collision theory and transition state theory. The course also includes calculating entropy and enthalpy using the Eyring equation and examining the impact of ionic strength and hydrostatic pressure on reaction rates. Here is a brief description of course outlines.</p> <p>Concept of rate law and order of reaction, Kinetics of 3rd order reaction with different concentrations and molecular identity, kinetics of opposing, parallel and consecutive reactions, basic experimental methods, Kinetics of thermally excited chain reactions like reaction of H₂ and Br₂, kinetics of thermal decomposition of ozone, N₂O₅ and CH₃CHO.</p> <p>Effect of temperature on reaction rate, mathematical treatment of collision theory and transition state theory of bimolecular reactions, Comparison of collision theory and Transition state theory with Arrhenius theory, Calculation of entropy and enthalpy by Eyring equation, effect of ionic strength and hydrostatic pressure on the rate of reaction in solution.</p>					
Learning Outcomes					
<p>On the completion of the course, the students will:</p> <ol style="list-style-type: none"> 1. Understand and apply rate laws and reaction orders, including third-order reactions. 2. Analyze the kinetics of opposing, parallel, and consecutive reactions, as well as thermally excited chain reactions and thermal decomposition processes. 3. Evaluate the effect of temperature on reaction rates and compare collision theory, transition state theory, and Arrhenius theory. 4. Calculate entropy and enthalpy using the Eyring equation. 5. Assess the impact of ionic strength and hydrostatic pressure on reaction rates in solutions. 					
Course Content				Assignments/Readings	
Week 1	Unit-Chemical Kinetics				
	Concept of rate law and order of reaction				
Week 2	Kinetics of 3 rd order reaction with different concentrations and molecular identity				
	Continued				
Week 3	Continued				
	Kinetics of opposing reactions				
Week 4	Continued				
	Continued				
Week 5	Continued				
	Kinetics of parallel reactions				
Week 6	Continued				
	Kinetics of consecutive reactions				
Week 7	Continued				
	Steady State Approximation				
Week 8	Mid Term Examinations				

Week 9	Kinetics of thermal decomposition of ozone, N_2O_5 and CH_3CHO and combination of H_2 and Br_2 .	
	Continued	
Week 10	Continued	
	Continued	
Week 11	Basic experimental methods	
	Effect of temperature on reaction rate	
Week 12	Mathematical treatment of collision theory)	
	Mathematical treatment of transition state theory of bimolecular reactions (Eyring equation Effect of hydrostatic pressure on rate of reaction	
Week 13	Continued	
	Effect of ionic strength on rate of reaction in solution	
Week 14	Effect of hydrostatic pressure on the rate of reaction in solution	
	Continued	
Week 15	Relaxation methods of kinetics	
	Continued	
Week 16	Final Term Examinations	
Textbooks and Reading Material		
<ol style="list-style-type: none"> 1. Bhatti, H. N. and Farooqi, Z. H., Modern Physical Chemistry, Revised ed., Caravan Book House, Lahore, 2014. 2. Brouard, M., Reaction Dynamics, Oxford University Press, New York, 1998. 3. Espenson, J. H., Chemical Kinetics and Reaction Mechanism, 2nd edition, WCB/McGraw-Hill, New York, 1995. 4. Hammes, G. G., Principles of Chemical Kinetics, Academic Press, New York, 1976. 5. Houston, P. L., Chemical Kinetics and Reaction Dynamics, McGraw-Hill, Dubuque, IA, 2001. 6. Laidler, K. J., Chemical Kinetics, 3rd ed., Harper & Row, New York. 7. Physical.....? 		
Teaching Learning Strategies		
<ol style="list-style-type: none"> 1. Lectures 2. Group Discussion 3. Laboratory work 4. Seminar/ Workshop 		
Assignments: Types and Number with Calendar		
<ol style="list-style-type: none"> 1. Numerical problem sets relevant to topic will be given as assignments from week 1 to week 16. 2. Literature review based assignment relevant to the course will also be given during the course. 		