



Course Specifications

Course Title:	Chemical Kinetics
Course Code:	CHEM 335
Program:	BSc in Chemistry
Department:	Chemistry
College:	Science
Institution:	KSU

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A. Course Identification

1. Credit hours: 3(2 + 0 + 1)
2. Course type a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 5 th level / Third year
4. Pre-requisites for this course (if any): 232CHEM
5. Co-requisites for this course (if any):

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	50
2	Blended		
3	E-learning		
4	Distance learning		
5	Other	30	30

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

An introduction to the basics of chemical kinetics including: Considering the rate of reaction and other time related phenomena. Factors affecting the rate of chemical process. Theories describing occurrence of the reaction. The bath the reaction follows as reaction mechanism.

2. Course Main Objective

- Understanding the basic principles of chemical kinetics.
- Recognizing the time scale of chemical process occurrences.
- Developing the related mathematical skills of the student.
- Relating the theoretical aspects of the course to the experimental results.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Define the basic terminologies related to this course of reaction rate , rate law , law expression, Rate constant and half-life	K1
1.2	Define the factors that affect on chemical reaction	K1
1.3	Differentiate between different order of chemical reactions	K2
1.4	Describing the occurrence of the reaction using collision theory and transition complex theory	K3
1.5	Illustrate the effect of temperature on chemical reaction	K1
1.6	Describe activation energy & frequency factor	K3
1.7	Use the approximation (RDS & SSA) to find the right rate expression for proposed mechanism.	K3
1.8	Recognize some types of complex reaction	K2
1.9	Identify catalyst and intermediate in different mechanism .	K1
2	Skills :	
2.1	Determine the rate law expression using the following methods experimental data of initial rate and half-life, also graphing data	S5
2.2	calculate the following reaction related parameters: rate constants, half-life, concentrations, energy of activation, temperature, Arrhenius theory parameters, Free energy of activation	S2
2.3	Analyzing the results of ten lab experiments successfully while taking praises measurement and presented in a form of written reports.	S2
2...	finding the rate constant units	S1
3	Values:	
3.1	Work independently and as a part of a team during group discussions and exercises.	V2
3.2	Demonstrate safe handling of laboratory chemicals and glass ware during experiments.	V3
3.3	Develop a habit of self-learning	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Thermodynamics vs Kinetics Chemical Kinetics, 1 Macroscopic level, 2 Microscopic level (molecular) Importance of Reaction kinetics Reaction Rates Calculation, Stoichiometry and factors affecting the chemical rate.	6
2	Experimental methods of measuring reaction rate(Integration Method, Initial rates Method Flooding or Isolation Method half-life Method)	4
3	Simple reactions (First-Order Reactions, Second -order Reaction, Zero-order Reaction and half-life)	8
4	MIDEXAM	2
5	Kinetics of complex reactions	4

	(1) Competitive Reactions (parallel reactions): first-order case. (2) Consecutive reactions (series reactions): first-order case. (3) reversible reactions: first-order case.	
6	Temperature Dependence of Reaction Rate Temperature and the Rate Constant Arrhenius equation activation energy Maxwell–Boltzmann Distributions The Arrhenius Equation: The exponential factor	2
7	Transition state theory	2
8	Collisions theory Collision Theory vs Transition State Theory	2
9	Different experiments related to kinetic topics	30
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Define the basic terminologies related to this course of reaction rate, rate law, law expression, rate constant, factors affecting it, differentiate between different order of chemical reactions	<ul style="list-style-type: none"> • Class Lecture • Class discussion • Practical examples • Laboratory work • Homework assignment 	<ul style="list-style-type: none"> • In class quizzes • assignment • Mid exam • Final exam
1.2	Describing the occurrence of the reaction using collision theory and transition complex theory		
1.3	Illustrate the effect of temperature on chemical reaction, describe activation energy & frequency factor		
1.4	Identify catalyst and intermediate in different mechanism. Use the approximation (RDS & SSA) to find the right rate expression for proposed mechanism for different types of complex reaction		
2.0	Skills		
2.1	Analyzing the results of ten lab experiments and formulate a written reports to determine the rate law expression using the following methods: initial rate and half-life, also graphing data and calculate the following reaction related parameters:	<ul style="list-style-type: none"> • Solving problems • Class lectures mixed with Tutorial. 	<ul style="list-style-type: none"> • In class quizzes • assignment • Mid exam • Final exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	rate constants, half-life, concentrations, energy of activation, temperature, Arrhenius theory parameters, energy of activation	<ul style="list-style-type: none"> some time excel for graphing. laboratory work 	
3.0	Values		
3.1	Develop a habit of self-learning in working independently and as a part of a team during group discussions and exercises.	Working as a team work in lab . Perform lab. Experiments individually and in groups Solve problems.	<ul style="list-style-type: none"> Individual performance within the group. Reports Midterm exam final exams

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes	4&11	5%
2	Homework and assessments	Each week	10%
4	Midterm exam	10	15%
5	Executing lab experiments and writing reports	Each week	30%
6	Final exam	End of term	40%
7			
8			
9			

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
 Office hours (5 hours per week)
 Help session (problem solving)

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ul style="list-style-type: none"> Chemical Kinetics (3rd Edition.1987), Keith J. Laidler Chemistry 10th Edition Raymond Chang. ISBN 978-0-07-351109-2 Physical Chemistry for the Chemical Sciences by Raymond Chang, Jr. Thoman John. ISBN 978-1-891389-69-6 Principles of Chemical Kinetics, Second Edition, James E. House, ISBN: 978-0-12-356787-1 Chemical kinetics (Arabic). (1 st edition. 1998). Suliman Alkhwaiter
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Essential References Materials	manual text for lab experiments, pdf text for Assignments.
Electronic Materials	Power point slides, pdf, the internet and access for Excel software,
Other Learning Materials	Learning resources in the internet.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Class rooms and laboratories with capacity of a maximum of 20 .
Technology Resources (AV, data show, Smart Board, software, etc.)	data show, Smart Board and software
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Non

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching style and assessment methods.	Department	Course questionnaire and end of course questionnaire (on edugate).
Achievement of course learning outcomes.		
Quality of learning resources.		

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	25-12-2020