هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Chemical Kinetics**
Course Code:	**CHEM 342**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**

Table of Contents

A. Course Identification

1. Credit hours: 3hrs **Workload:** 191 **ECTS:** 6.8	
2. Course type	
a. University ☐ College ☐ Department ☑ Others ☐	
b. Required ☑ Elective ☐	
3. Level/year at which this course is offered: Level 5 Year3	
4. Pre-requisites for this course (if any)**:** none	
5. Co-requisites for this course (if any)**:** none	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom LAB	30 30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

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

B. Course Objectives and Learning Outcomes

1. Course Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Chemical Kinetics	*CHEM 342*	*2*	*2*	*3*	*3rd*	*5th*	*none*

Course objectives: They are to identify the following:

1.The laws of reaction rate for different chemical reaction,
2.Temperature effect on the reaction rate and Arrhenius equation.
3.Collision theory of unimolecular and bimolecular reaction.

Syllabus: A-Theoretical contents

General concepts of kinetic chemistry; rate of reaction and factors affecting on it , the reaction rate constant, order and Molecularity, pseudo- order reactions, the rate equations and half life period- The derivation of the different rate laws and half life period, zero, 1st, 2nd, and 3rd order reactions- Determination of the order of the reaction; integration, graphical, half- life period, Van,tHoff,s differential and Ostwald isolation method-Rate laws for complex reactions; parallel, consecutive and chain reactions- Temperature effect on reaction rate- Derivation of Arrhenius equation- Determination of the activation energy of the chemical reactions – Effect of the catalyst on the activation energy-Reaction rate theories; Collision theory and Transition state theory.

Syllabus: B- Practical contents

Experimental work illustrating selected parts of the theoretical content.

*See attachment

2. Course Main Objective

This course aims to give the students, knowledge about the principles of kinetic chemistry.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and Understanding** ***Upon completion of this course, student will be able to :***	
1.1	***Demonstrate a broad knowledge and understanding on principal of Kinetic Chemistry, Concepts and terminology of kinetic chemistry topics including; rate of reaction and factors affecting on it, the reaction rate constant and its units, order and Molecularity, pseudo- order reactions, the rate equations, half-life period, complex reactions, activation energy … etc(P)***	*K1*
1.2	***Describe the different phenomena associated with kinetic chemistry; the different factors that can affect the rate of the chemical reactions, the difference between order and Molecularity, methods of determination of the order of the reaction, Effect of the catalyst on the activation energy, collision theory and transition state theory… etc(P)***	*K2*
2	**Skills :** ***Upon completion of this course, student will be able to:***	

2.1	**Demonstrate the gained knowledge and skills to solve problems associated with different topics in the course as the reaction rate, the rate constant , half-life period , order of the reaction, the activation energy from applying the Arrhenius equation, Arrhenius factor, collision constant.** ***(P)***	***S1***
2.2	***Perform experiments in Kinetic chemistry, record, analyze, interpret the scientific data, and write reports. (P)***	***S2***
2.3	***Knows the proper procedures and regulations for safe handling and use of chemicals and can follow the proper procedures and regulations for safe handling when using chemicals. (P)***	***S3***
2.4	***Write a report on Kinetic Chemistry using communication and online technology in a good verbal and clear scientific language. (P)***	***S4***
3	**Values:** ***Upon completion of this course, student will be able to***	
3.1	***Working as a group leader in cooperation with other colleagues. (P)***	***V1***

C. Course Content

No	List of Topics	Contact Hours
1	***General concepts of kinetic chemistry.***	*6*
2	***Simple reactions; zero, 1st, 2nd, and 3rd order reactions.***	*8*
3	***Determination of the order of the reaction; integration, graphical, half- life period, Van't Hoff's differential and Ostwald isolation method.***	*4*
4	***Complex reactions; parallel, consecutive and chain reactions.***	*4*
5	***Arrhenius equation***	*4*
6	***Collision theory***	***2***
7	***Transition state theory.***	***2***
8	***Selected experiments related to the course 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** ***Upon completion of this course, student will be able to***		
1.1	***Demonstrate a broad knowledge and understanding on principal of Kinetic Chemistry, Concepts and terminology of kinetic chemistry topics including; rate of reaction and factors affecting on it , the reaction rate constant and its units, order and Molecularity, pseudo- order reactions, the rate equations ,half-life period, complex reactions, activation energy … etc(P)***	***Lectures, Class Discussion***	***Assignments, oral and written examinations.***
1.2	***Describe the different phenomena associated with kinetic chemistry; the different factors that can affect the rate of the chemical reactions, the difference between order and Molecularity, methods of determination of the order of the reaction, Effect of the catalyst on the activation energy, collision theory and transition state theory… etc(P)***	***Lectures, Class Discussion***	***Assignments, oral and written examinations***
2.0	**Skills** ***Upon completion of this course, student will be able to***		

2.1	*Demonstrate the gained knowledge and skills to solve problems associated with different topics in the course as the reaction rate, the rate constant, half-life period, order of the reaction, The activation energy from applying the Arrhenius equation, Arrhenius factor, collision constant. (P)*	*Lectures, Class Discussion*	*Assignments, oral and written examinations*
2.2	*Perform experiments in Kinetic chemistry, record, analyze, interpret the scientific data, and write reports. (P)*	*Lab work, group work*	*lab report and Lab notebook.*
2.3	*Knows the proper procedures and regulations for safe handling and use of chemicals and can follow the proper procedures and regulations for safe handling when using chemicals. (P)*	*lab demonstrations , hands-on student learning activities .*	*Observation of practical skills and Safety exam .*
2.4	*Write a report on Kinetic Chemistry using communication and online technology in a good verbal and clear scientific language.(P)*	*research activities, project*	*Assignments, reports, project and seminar.*
3.0	**Values** *Upon completion of this course, student will be able to*		
3.1	*Working as a group leader in cooperation with other colleagues. (P)*	*lab demonstrations , whole group and small group discussion*	*group project reports , Practical assignments and laboratory reports*

2. Assessment Tasks for Students

#	Assessment task*		Week Due	Percentage of Total Assessment Score
1	*Homework assignment*		*2*	*2 %*
2	*Lecture Quizzes*		*4*	*3%*
3	*Mid-term exam*		*8*	*15 %*
4	*Homework assignment*		*10*	*0%*
5	*Group work presentation*		*12*	*0%*
6	*LAB*	*Quiz in Safety*	*6*	*0%*
7		*LAB Sheet*	*15*	*10%*
8		*Final practical exam*	*15*	*15%*
9		*Lab report*	*15*	*5%*
10	*Final Exam*		*16*	*50%*
			Total	*100%*

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:

- *Instructor will be available for academic counseling on daily basis for at 4h/day during office hours.*
- *The office hours are listed in the instructor time table and delivered to students in the first lecturer in each semester.*
- *Instructor is available in a Watts App group with student.*
- *E-mail and Telephone number are delivered to student for any help during semesters.*

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	***Atkins' Physical Chemistry 11e: Volume 1: Thermodynamics and Kinetics*** ***Oct 30, 2018***
Essential References Materials	• ***Chemical Kinetics and Reaction Dynamics,*** 1st edition***, Paul L. Houston, 2006.*** • ***Chemical Kinetics and Reaction Dynamics , Santosh K. Upadhyay, Springer, 2006, ISBN 1-4020-4546-8 (HB) - ISBN 1-4020-4547-6 (e-book)*** • ***Principles of Chemical Kinetics ,*** 2nd edition***, James E. House, 2007.***
Electronic Materials	***course contents and materials are posted on Black board sites.***
Other Learning Materials	https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=kinetic+energy&type=wiki

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	***1 Lecture room(s) for groups of 50 students*** ***1 Lab room for group of 25student***
Technology Resources (AV, data show, Smart Board, software, etc.)	***Smart board, Data show, Internet*** ***1 Computer laboratory for groups of 25 students***
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	***Water distillation device, Ice maker, water bath and Balance***

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and Assessment	***Student***	***Likert-type Survey (CES) Indirect***
Extent of achievement of course learning outcomes	***Instructor &Course coordinator***	***Class room evaluation (direct & indirect)***
Quality of learning resources	***Program coordinator***	***Indirect***
Exam Quality assessment	***Assessment committee***	***Indirect***

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Qualityoflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Chemistry Department Council**
Reference No.	42 / 35 /102 112
Date	17 /09 /1442 Corresponding to 28 / 04 /2021

No	Title of Experiment	Chemicals	No of Weeks	Contact Hours
1	Introduction and lab safety		1	2
2	Heterocatalytic decomposition of hydrogen peroxide	Manganese dioxide, H_2O_2, $KMNO_4$, Sulphuric acid,	1	2
3	Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.	Methyl Acetate, Phenolphthalein, NaOH	1	2
4	Saponification of ethyl acetate.	Ethyl Acetate, Phenolphthalein, NaOH	1	2
5	Determination of rate constant of persulphate–iodide reaction	Potassium persulphate Potassium iodide, Sodium thiosulphate and Starch indicator.	1	2
6	Determination rate constant of hydrogen peroxide decomposition catalyzed by potassium iodide	H_2O_2, KMnO4, sulphuric acid, Potassium iodide	1	2
7	Determination of rate constant of iodination of acetone.	Acetone, Iodine solution, sulphuric acid, sodium thiosulphate, Starch indicator and Sodium acetate	1	2
8	Effect of temperature on the reaction rate of ester	Methyl Acetate, Phenolphthalein, NaOH	1	2
9	Determination Rate constant and Activation Energy of the reaction between hydrogen peroxide and hydrogen iodide	H_2SO_4. H_2O_2, $Na_2S_2O_3$. $5H_2O$, starch indicator.	1	2
10	Autocatalysis: Reaction of potassium permanganate with oxalic acid	manganese (II) sulphate, Oxalic acid, Sulphuric acid, potassium permanganate	1	2
11	The influence of concentration on the reaction between potassium permanganate and oxalic acid.	Oxalic acid, Potassium permanganate	1	2
12	Clock Reactions: Reaction order of the sulphite-iodate reaction	Conc.H_2SO_4- Sodium sulphite Na_2SO_3- Potassium iodate KIO_3 – Starch indicator.	1	2
13	Revision		2	4
14	Final Exam	.	1	2
		total	15	30

Attachment 1: