Course Specification
(Bachelor)

Course Title	**CHEMICAL KINETICS**
Course Code:	342CHEM-3
Program:	Bachelor of Science in Chemistry
Department:	**Physical sciences**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**TP-153 2024**
Last Revision Date:	5 may 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3hrs)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		

3. Level/year at which this course is offered: (level 5 / Year 3)

4. Course general Description:

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre- requisite
		Lec.	Prac.				
Chemical kinetics	342CHEM-3	2	2	3	3rd	5	241CHEM-3

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 chemical kinetics; 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,t Hoff,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*

5. Pre-requirements for this course (if any)**:**

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6. Co-requisites for this course (if any)**:**

none

7. Course Main Objective(s):

This course aims to give the students, knowledge about the principles of chemical kinetics.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	---
4.	**Tutorial**	---
5.	**Others (specify)**	---
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	***Demonstrate a broad knowledge and understanding on principal of chemical kinetics, Concepts and terminology of chemical kinetics 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***	***K1***	***Lectures, Class Discussion***.	***Objective question***s.

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	period, complex reactions, activation energy … etc(P)			
1.2	*Describe the different phenomena associated with chemical kinetics; 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*	*Lectures, Class Discussion.*	*Essay questions.*
2.0	**Skills**			
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*	*Lectures, Class Discussion.*	*Solving Problems.*
2.2	*Perform experiments in chemical kinetics, record, analyze, interpret the scientific data, and write reports. (I)*	*S2*	*Lab work, group work*	*Objective questions, Essay questions, lab report rubric.*
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. (I)*	*S2*	*lab demonstrations, hands-on student learning activities .*	*Safety exam*
3.0	**Values, autonomy, and responsibility**			
3.1	*Working as a group leader in cooperation with other colleagues. (P)*	V3	*lab demonstrations , whole group and small group discussion*	*Practical group Leader Rubric*

C. Course Content

No	List of Topics	Contact Hours
1.	***General concepts of chemical kinetics.***	*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.***	*8*
4.	***Complex reactions; parallel, consecutive and chain reactions.***	*2*
5.	***Arrhenius equation.***	*2*
6.	***Collision theory***.	***2***
7.	***Transition state theory.***	***2***
8.	***Selected experiments related to the course topics***	***30***
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Homework assignment***.	***3-13***	***5 %***
2.	***Mid-term exam.***	***9-12***	***15 %***
3.	***LAB Sheet***.	***15***	***5 %***
4.	***Quiz in Safety***.	***15***	***3%***
5.	***Final practical exam***.	***15***	***9 %***
6.	***Lab report***.	***2-14***	***10 %***
7.	***Group Leader evaluation***.	***2-14***	***3%***
8.	***Final Exam.***	***16-17***	***50%***
	Total		***100***

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	• ***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.***
Supportive References	***Atkins' Physical Chemistry 11e: Volume 1: Thermodynamics and Kinetics Oct 30, 2018***

	اساسيات الحركية الكيميائية – د فكيهة محمد الطيب هيكل - دار النشر الدولي - الطبعة الأولى 2003 م
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. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	***1 Lecture room(s) for groups of 50 students*** ***1 Lab room for group of 25 students.***
Technology equipment (projector, smart board, software)	***Smart board, Data show, Internet*** ***1 Computer laboratory for groups of 25 students***.
Other equipment (depending on the nature of the specialty)	***Water distillation device, Ice maker, water bath and Balance.***

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of Students assessment	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Psci2415
DATE	28/03/1446 Corresponding to 1 / 10 /2024

H. Attachments

1- Practical Work

Week	Experimental Title	Chemicals used	Remarks
1	*Introduction and lab safety*		
2	*Catalytic decomposition of hydrogen peroxide*	*H_2O_2, KMnO4, sulphuric acid and MnO_2*	*None*
3	*Kinetic study of hydrolysis of ethyl acetate catalyzed by acid*	*Ethyl Acetate,HCl, Phenolphthalein and NaOH*	*None*
4	*Saponification of ethyl acetate.*	*Ethyl Acetate, Phenolphthalein and NaOH*	*None*
5	*Determination of rate constant of Iodination of acetone reaction*	*Acetone, Iodine solution, sulphuric acid, sodium thiosulphate, Starch indicator and Sodium acetate*	*None*
6	*Effect of temperature on the reaction rate of hydrolysis of ethyl acetate catalyzed by acid and calculation of activation energy*	*ethyl acetate, Sodium acetate and Hydrochloric acid*	*None*
7	*Determination of rate constant of persulphate–iodide reaction*	*Potassium persulphate Potassium iodide, Sodium thiosulphate and Starch indicator.*	*None*
8	*Reaction rate of magnesium and hydrochloric acid*	*Magnesium and Hydrochloric acid*	*None*
9	*Revision*		
10	*Final Exam*		

2- Blue Print

Course Name	**Chemical Kinetics**
Course Code	**342 CHEM-3**

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	18	18	34	24	3	--	3	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (18M)	***H.W***	***Objective question***	4	1	1
			Mid term	***Objective question***	8	4	4
			Final Exam	***Objective question***	13	13	13
	K2	1.2 (18M)	***H.W***	***Essay question***	2	1	1
			Mid term	***Essay question***	2	4	4
			Final Exam	***Essay question***	6	13	13
Skills	S1	2.1 (34M)	***H.W***	***Solving Problems***	3	3	3
			Mid term	***Solving Problems***	3	7	7
			Final Exam	***Solving Problems***	6	24	24
	S2	2.2 (24M)	***Practical Sheet***	***Objective question***	6	3	3
				Essay question	2	2	2
			Lab Report	***Lab report***	7	10	10
			Final Lab Exam	***Lab Exam***	1	9	9
	S3	2.3 (3M)	***Safety Quiz***	***Objective question***	6	3	3
Value	V1	3.1 (3 M)	***Continuous assessment***	***Group Leader evaluation rubric***	-	3	3
	TOTAL	100					100