




# Course Specifications

<b>Course Title:</b>	<b>Kinetic Chemistry</b>
<b>Course Code:</b>	<b>4022144-3</b>
<b>Program:</b>	<b>Chemistry and Industrial Chemistry</b>
<b>Department:</b>	<b>Chemistry</b>
<b>College:</b>	<b>Applied Sciences</b>
<b>Institution:</b>	<b>Umm Al-Qura University</b>



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## A. Course Identification

<b>1. Credit hours:</b> 3 (2 theoretical + 1 practical)
<b>2. Course type:</b>
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"/>
<b>3. Level/year at which this course is offered:</b> 5 <sup>th</sup> level/3 <sup>rd</sup> year
<b>4. Pre-requisites for this course (if any):</b> Thermodynamics + Volumetric and Gravimetric Analytical Chemistry.
<b>5. Co-requisites for this course (if any):</b> ---

### 6. Mode of Instruction (mark all that apply)

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

### 7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
<b>Contact Hours</b>		
1	Lecture	30
2	Laboratory/Studio	45
3	Tutorial	--
4	Others (specify)	--
	<b>Total</b>	<b>75</b>
<b>Other Learning Hours*</b>		
1	Study	52
2	Assignments	8
3	Library	4
4	Projects/Research Essays/Theses	6
5	Others (specify)	20
	<b>Total</b>	<b>90</b>

\* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

### 1. Course Description

The course deals with the basic principles of chemical kinetics including reaction rate, rate laws, methods of following a reaction, analyzing the experimental data of a given reaction, description of the fundamentals of catalysis and influence of the catalyst on the reaction rate.

### 2. Course Main Objective

By the end of this course the students will be able to describe and explain:

1. Principles of kinetic chemistry.
2. Determination of the rate law from the experimental data.
3. Sequence of the elementary steps "mechanism" of a reaction.
4. Effect of catalyst on the reaction rate.

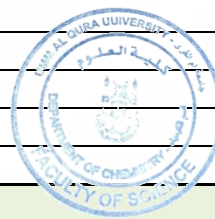
### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge:</b>	
1.1	Recognize the conventional techniques of following a reaction.	K3
1.2	Mention the different reaction orders and their rate laws.	K1
1.3	Define the reaction rate constant of various reaction orders.	K3
1.4	List the factors affecting the reaction rate.	K1
1.5	Describe the different types of complex reactions and their rate laws.	K3
1.6	Write the catalysis and its effect on the reaction rate.	K3
1.7	Define the kinetics and mechanism of enzymatic reactions.	K1
1.8	Memorize the kinetics and mechanism of photochemical reactions.	K3
1.9	Recognize the reactions in solutions and the kinetics of these reactions.	K1
<b>2</b>	<b>Skills :</b>	
2.1	Compare between the different experimental techniques of following a reaction.	S1
2.2	Explain the rate-law expressions for different reaction orders.	S1
2.3	Solve the kinetic problems for all orders.	S2
2.4	Interpret the mechanism of various reactions.	S2
2.5	Solve the kinetic problems relating temperature dependence of the rate constant.	S2
<b>3</b>	<b>Competence:</b>	
3.1	Work in a team to perform a specific experimental tasks.	C2
3.2	Work independently to handle chemicals.	C1
3.3	Communicate results of work to classmate and participation in class or laboratory discussions	C4
3.4	Work effectively both in a team, and independently on solving chemistry problems.	C3
3.5	Communicate with his lecturer and colleagues	C4

## C. Course Content

No	List of Topics	Contact Hours
1	General concepts in chemical kinetics.	2
2	Factors affecting the rate of reaction.	2
3	Conventional techniques of following a reaction.	2

4	Integration of simple rate laws.	2
5	Types of reaction orders.	2
6	Determining the rate law from experimental data.	2
7	Dependence of rate on temperature.	2
8	Theories of chemical reactions.	2
9	Kinetics of complex reactions.	2
10	Effect of catalyst on the reaction rate.	2
11	Kinetics of catalysis by enzymes.	2
12	Kinetics of photochemical reactions.	2
13	Kinetics of reactions in solutions.	4
14	General revision and Mid-Term Exam.	2
<b>Total</b>		<b>30</b>



## D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
1.1	Recognize the conventional techniques of following a reaction.	Lecture and web-based study	- Short essays - Oral presentation
1.2	Mention the different reaction orders and their rate laws.	Lecture	- Home work of concept mapping - Quiz
1.3	Define the reaction rate constant of various reaction orders.	Lecture	Quiz
1.4	List the factors affecting the reaction rate.	Lecture	Exam
1.5	Describe the different types of complex reactions and their rate laws.	Lecture	- Theoretical problems - Quiz
1.6	Write the catalysis and its effect on the reaction rate.	Discussion	Quiz
1.7	Define the kinetics and mechanism of enzymatic reactions.	Discussion	Exam
1.8	Memorize the kinetics and mechanism of photochemical reactions.	Library visits	Short essays
1.9	Recognize the reactions in solutions and the kinetics of these reactions.	Web-based study	Exam
<b>2.0</b>	<b>Skills</b>		
2.1	Compare between the different experimental techniques of following a reaction.	Discussion	Quiz
2.2	Explain the rate-law expressions for different reaction orders.	Lecture	-Theoretical problems - Exam
2.3	Solve the kinetic problems for all orders.	Lecture Web-based study	-Numerical problem sets - Exam
2.4	Interpret the mechanism of various reactions.	Web-based study	-Theoretical problems

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.5	Solve the kinetic problems relating temperature dependence of the rate constant.	Lecture	- Group problem solving - Exam
<b>3.0</b>	<b>Competence</b>		
3.1	Work in a team to perform a specific experimental tasks.	Group lab work	Reports
3.2	Work independently to handle chemicals	Lecture	- Participation - Quiz
3.3	Communicate results of work to classmate and participation in class or laboratory discussions	Lecture	Exam
3.4	Work effectively both in a team, and independently on solving chemistry problems.	Group work and Independent study	- Group problem solving - Exam
3.5	Communicate with his lecturer and colleagues	Discussion	- Participation

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or activities.	--	10 %
2	Midterm Exam.	8	20 %
3	Practical Exam.	14	30 %
4	Final Exam.(2 hours exam)	16	40 %

\*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 :

- Weekly office hours for discussion with the students.
- Academic advising for students.
- Availability of Staff members to provide counseling and advice.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>• An Introduction to Chemical Kinetics, Margaret Robson Wright, New York, John Wiley &amp; Sons, 2004.</li> <li>• Kinetics of Chemical Reactions, Guy Marin, Gregory S. Yablonsky,</li> </ul>
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	<p>John Wiley, 2011.</p> <ul style="list-style-type: none"> <li>• Chemical Kinetics, Luis Arnaut, Sebastiao Formosinho, Hugh Burrows, 1<sup>st</sup> ed., Elsevier Science, 2006.</li> </ul>
<b>Essential References Materials</b>	<ul style="list-style-type: none"> <li>• Physical Chemistry, Amazon logo Silbey, R. R. Alberty, M. Bawendi, 4<sup>th</sup> ed., John Wiley &amp; Sons, 2004.</li> <li>• Physical Chemistry, Peter Atkins &amp; Julio de Paula, 10<sup>th</sup> ed., W. H. Freeman and Company, 2014.</li> <li>• Principles of Chemical Kinetics, Second Edition, James E. House, 2<sup>nd</sup> ed., Academic Press, 2007.</li> </ul>
<b>Electronic Materials</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.chemweb.com">http://www.chemweb.com</a></li> <li>• <a href="http://www.sciencedirect.com">http://www.sciencedirect.com</a></li> <li>• <a href="http://www.rsc.org">http://www.rsc.org</a></li> <li>• Websites on the internet relevant to the topics of the course</li> </ul>
<b>Other Learning Materials</b>	Not required

## 2. Facilities Required

Item	Resources
<p><b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)</p>	Well-equipped lecture halls.
<p><b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)</p>	Computer and data show.
<p><b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)</p>	No other requirements.

## G. Course Quality Evaluation


Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resources	Students	Complete the questionnaire evaluation of the course periodically.
Effectiveness of teaching and assessment.	Program Leaders	Observation of students performing a task.
Extent of achievement of course learning outcomes.	Peer Reviewer	Checking selected exam papers, and student assignments.

**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	Dr. Ahmed Fawzy 
Reference No.	
Date	

Received by: Dr. Ismail Althagafi

Department Head

Signature:



Date: 20/12/2019

