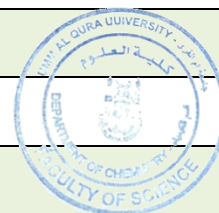




# Course Specifications

<b>Course Title:</b>	<b>Physical organic chemistry</b>
<b>Course Code:</b>	<b>4023551-3</b>
<b>Program:</b>	<b>Chemistry and Industrial Chemistry</b>
<b>Department:</b>	<b>Chemistry</b>
<b>College:</b>	<b>Applied Science</b>
<b>Institution:</b>	<b>Umm Al-Qura University</b>



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## A. Course Identification

<b>1. Credit hours:</b>
<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> Aromatic Chemistry
<b>5. Co-requisites for this course (if any):</b> None

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

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	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	45
2	Assignments	---
3	Practical	---
4	Exams & Quizzes	6
	<b>Total</b>	<b>51</b>
<b>Other Learning Hours*</b>		
1	Study	68
2	Assignments	10
3	Library	0
4	Projects/Research Essays/Theses	4
5	Others (specify) : Quizzes and Exam preparation	20
	<b>Total</b>	<b>102</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 expands on subjects covered in the introductory organic chemistry core courses and focuses primarily on the study of the interrelationships between structure and reactivity of organic molecules. Thus, quantitative treatments (for rate and equilibrium constants) are presented and used to explain (and predict) the effects of substituents and solvents on the rates

and product ratios of reactions of organic compounds. Also, different types of intermediates and their stability are discussed.

## 2. Course Main Objective

By ending this course, students should be familiar with :

- The basic concepts of physical organic chemistry including the mechanism of chemical reactions.
- The stereochemistry in different reaction types and chirality.

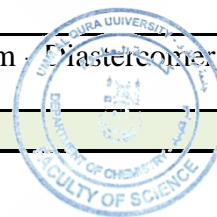
## 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge:</b>	
1.1	Memorize of the basic rules in organic chemistry	K1
1.2	Understand of the division of types of electronic effects of groups in molecules.	K2
1.3	Knowledge and understanding of the mechanism of different types of organic reactions	K1, K4
1.4	Understand and differentiate SN1 and SN2 Mechanisms	K1, K4
1.5	Knowledge of types of isomerism	K1
1.6	Draw a shape of open and cyclic compounds	K1
1.7	Understand of the absolute configuration	K6
1.8	Knowledge of Diastereomers and their properties and Molecular Chirality.	K4
<b>2</b>	<b>Skills :</b>	
2.1	Compare different types of electronic effects in molecules.	S1
2.2	Predict the path of interaction and then find out mechanism	S3, S4, S7
2.3	Plan shape of the stereochemistry of organic compounds.	S1
2.4	Discuss the different types of isomerism	S1
<b>3</b>	<b>Competence:</b>	
3.1	Divide the student in to teams to perform some joint reports.	C1
3.2	Develop the student to accept the opinion of his colleague in his participation to perform an active presentation for the topic related to the course, and evaluate the results to find out the response of students for the collective cooperation.	C1
3.3	Communicate effectively in oral and written forms	C2, C3
3.4	Apply information and communication technologies	C4
3.5	Apply basic mathematical and statistical techniques.	C4

## C. Course Content

No	List of Topics	Contact Hours
1	- Thermodynamic parameters affected the reactions - Reaction kinetic and determination of the reaction orders	6
2	Determination of reaction mechanism by physical and chemical properties	3
3	Factors affecting the distribution of electrons in molecules: (Inductive effect- Mesomeric effect- Steric effect).	3
4	Nucleophilic substitution reaction SN <sup>1</sup> and SN <sup>2</sup>	6

5	Elimination reactions E1 and E2	3
6	Electrophilic addition to carbon-carbon double bond. Nucleophilic addition to carbonyl group	3
7	Free radicals reactions	3
8	- Solvent effect on chemical reactions. -The chemistry of the reactive intermediate such as carboanion, carbocation, carbens and free radicals	3
9	Introduction to stereochemistry: Isomerism - Configuration - shape and types of isomerism: structural and conformational	3
10	conformational isomerism, Geometrical isomerism, Optical isomerism	6
11	Chiral study and their properties	3
12	Compounds that contain more than one chiral carbon atom. Diastereomers and their properties	3
<b>Total</b>		<b>45</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	Memorize of the basic rules in organic chemistry	Lecture and library based study	Written exams
1.2	Understand of the division of types of electronic effects of groups in molecules.	Lecture and web based study	Written exams
1.3	Knowledge and understanding of the mechanism of different types of organic reactions	Lecture and library based study	Written exams
1.4	Understand and differentiate SN1 and SN2 Mechanisms	Lecture and library based study	Written exams
1.5	Knowledge of types of isomerism	Lecture and web based study	Written exams
1.6	Draw a shape of open and cyclic compounds	Lecture and library based study	Written exams
1.7	Understand of the absolute configuration	Scientific discussion and web based study.	Written exams
1.8	Knowledge of Diastereomers and their properties and Molecular Chirality.	Scientific discussion and web based study.	Written exams
<b>2.0</b>	<b>Skills</b>		
2.1	Compare different types of electronic effects in molecules.	Lecture and web based study.	Periodic tests and assignments.
2.2	Predict the path of interaction and then find out mechanism	Scientific discussion and library based activities.	Final exam and measuring the response to the assignments.
2.3	Plan shape of the stereochemistry of organic compounds.	Lecture and web based study.	Periodic tests and assignments.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.4	Discuss the different types of isomerism	Scientific discussion and library based activities.	Final exam and measuring the response to the assignments.
<b>3.0</b>	<b>Competence</b>		
3.1	Divide the student in to teams to perform some joint reports.	Encourage the solving problems in groups during lecture.	Homework and group reports.
3.2	Develop the student to accept the opinion of his colleague in his participation to perform an active presentation for the topic related to the course, and evaluate the results to find out the response of students for the collective cooperation.	Making open discussion about certain recent topic of the course.	Homework and group reports
3.3	Communicate effectively in oral and written forms	Periodic group duties.	Group presentations.
3.4	Apply information and communication technologies	Web-based reports and studies related to physical organic chemistry,	Assessment of individual tasks and duties.
3.5	Apply basic mathematical and statistical techniques.	Web-based reports and studies related to physical organic chemistry,	Assessment of individual tasks and duties.

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or activities.	--	10 %
2	First Periodic Exam.	6	20 %
3	Second Periodic Exam.	12	20 %
4	Final Exam.(2 hours exam)	16	50 %

\*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: During the working hours weekly,
- 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>• Eric V. Anslyn, Dennis A. Dougherty "<i>Modern Physical Organic Chemistry</i>", University Science Books Sausalito, California, 2005.</li><li>• Howard Maskill "<i>Structure and Reactivity in Organic Chemistry, Volume 81 of Oxford Chemistry Primers</i>" 1999, OUP Oxford.</li></ul>
<b>Essential References Materials</b>	<ul style="list-style-type: none"><li>• John McMurry's "<i>Organic Chemistry, 8th edition, International Edition</i>" 2011, Brooks/Cole.</li><li>• T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder "<i>Organic Chemistry, 11th Edition, International Student Version</i>" 2013, John Wiley &amp; Sons.</li><li>• R. K. Sharma "<i>Stereochemistry, Volume 4</i>" 2008, Discovery Publishing House.</li><li>• Michael J. T. Robinson "<i>Organic Stereochemistry</i>" 2000, OUP Oxford.</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></ul>
<b>Other Learning Materials</b>	<ul style="list-style-type: none"><li>• Microsoft PowerPoint, Microsoft Word, Microsoft Excel.</li><li>• Videos on physical organic chemistry.</li><li>• CD for learning physical organic chemistry.</li></ul>

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Well-equipped lecture halls.
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Room equipped with computer, data show and TV.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	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	Periodic review of final exams and the student's degrees in this course.
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	
Reference No.	
Date	

Received by: Dr. Ismail Althagafi

Department Head

Signature:



Date: 20/12/2019

