



Course Specifications

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

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A. Course Identification

1. Credit hours: 3
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: 7 th level / 3 th year
4. Pre-requisites for this course (if any): Chemistry of Aromatic Compound
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	√	73%
2	Blended	---	---
3	E-learning	√	27%
4	Distance learning	---	---
5	Other	---	---

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	--
3	Tutorial	--
4	Others (E-learning + Exams + office hours)	10
	Total	32

B. Course Objectives and Learning Outcomes

1. Course Description

Physical organic chemistry focuses on relating the structure to the reactivity of Organic molecules through the electronic effects and the steric effect, the different methods of determining a reaction mechanism, interpret and suggest the mechanisms of some common organic reactions such as nucleophilic and electrophonic substitution reaction, elimination and addition reactions and solvent effects also, Stereochemistry.

2. Course Main Objective

The students will gain knowledge about physical organic chemistry including the mechanism of chemical reactions and stereochemistry.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Familiar with the basic concepts and importance of chemistry in physical organic chemistry field	K1
1.2	Understand SN1 and SN2 Mechanisms.	K2

CLOs		Aligned PLOs
1.3	Knowledge and understanding of the mechanism of different types of organic reactions.	K2
1.4	Knowledge of stereochemistry.	K2
2	Skills:	
2.1	Summarize the different types of electronic effects in molecules.	S1
2.2	Understanding the path of interaction and then find out mechanism.	S1
2.3	Developing skills of drawing shape of the stereochemistry of organic compounds.	S1
2.4	Understanding of the different types of isomerism.	S1
3	Values:	
3.1	Demonstrate commitment to professional and academic values, and ethics in the field of physical organic chemistry.	V1

C. Course Content

No	List of Topics	Contact Hours
1	Thermodynamic parameters affected the reactions.	2+2E
2	Reaction kinetic and determination of the reaction orders.	4+2E
3	Determination of reaction mechanism by physical and chemical properties.	4
4	Factors affecting the distribution of electrons in molecules.	2
5	Nucleophilic substitution reaction (SN1 & SN2).	4
6	Elimination reactions (E1 & E2).	2
7	Solvent effect on chemical reactions.	2
8	Introduction to stereochemistry.	2+ 2E
Total		28

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	Familiar with the basic concepts and importance of chemistry in physical organic chemistry field	<ul style="list-style-type: none"> Lectures Library visits Web-based study E-Learning 	Mid term and Final Exam. Active participation of students within their group on blackboard
1.2	Understand SN1 and SN2 Mechanisms.	<ul style="list-style-type: none"> Lectures Scientific discussion Web-based study 	Mid term . Final Exam. Class discussion.
1.3	Knowledge and understanding of the mechanism of different types of organic	<ul style="list-style-type: none"> Lectures Scientific discussion 	Mid term . Final Exam.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	reactions.		
1.4	Knowledge of stereochemistry.	<ul style="list-style-type: none"> • Web-based study • Lectures • Scientific discussion • Web-based study 	Class discussion. Mid term . Final Exam. Class discussion.
2.0	Skills		
2.1	Summarize the different types of electronic effects in molecules.	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Web-based study • E-Learning 	Mid term and final Exam. Class discussion. Assignments and activities on blackboard
2.2	Understanding the path of interaction and then find out mechanism.	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Web-based study • E-learning by virtual class room 	Mid term . Final Exam. Class discussion.
2.3	Developing skills of drawing shape of the stereochemistry of organic compounds.	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Web-based study • E-learning by virtual class room 	Mid term . Final Exam. Class discussion.
2.4	Understanding of Stereochemistry.	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Web-based study 	Mid term . Final Exam. Class discussion.
2.5	Collect a data using computers and internet to find all information related to physical organic.	<ul style="list-style-type: none"> • Self-Directed private Study 	Assignments and activities
2.6	Communicate effectively using theoretical basis of evaluation and processing of physical organic and stereochemistry.	<ul style="list-style-type: none"> • Cooperative learning and Group Presentations 	Report and research on Project production
3.0	Values		
3.1	demonstrate commitment to professional and academic values, and ethics in the field of physical organic chemistry .	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Web-based study • Library visits 	Mid term . Final Exam. Class discussion. Assignment activities

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments and activities	All weeks	10%
2	E-learning	All weeks	10%
3	Mid-term Exam	6	30%
4	Final Exam. (2 hours exam)	12	50%
5	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 :

- We have faculty members to provide counselling and academic advice.
- 2 hours per week as office hours are available for discussion with the students.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ul style="list-style-type: none"> • John McMurry's "<i>Organic Chemistry, 8th edition, International Edition</i>" 2011, Brooks/Cole. • T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder "<i>Organic Chemistry, 11th Edition, International Student Version</i>" 2013, John Wiley & Sons. • R. K. Sharma "<i>Stereochemistry, Volume 4</i>" 2008, Discovery Publishing House. • Michael J. T. Robinson "<i>Organic Stereochemistry</i>" 2000, OUP Oxford. • Howard Maskill "<i>Structure and Reactivity in Organic Chemistry, Volume 81 of Oxford Chemistry Primers</i>" 1999, OUP Oxford.
Essential References Materials	<ul style="list-style-type: none"> • Lecture Hand outs available on the coordinator website
Electronic Materials	<ul style="list-style-type: none"> • http://www.chemweb.com • http://www.sciencedirect.com • http://www.rsc.org
Other Learning Materials	<ul style="list-style-type: none"> • Microsoft Power Point, Excel and Microsoft Word • Professional standards or regulations and software • Computer-based programs/CD

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> • Classrooms capacity (30) students. • Providing hall of teaching aids including computers and projector.
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> • Room equipped with computer and projector and TV

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	-----

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students	<u>Indirect</u> (Online survey at the end of the semester (Program survey, Experience survey & course evaluation) and graduates survey).
Effectiveness of teaching	Faculty members	<u>Direct</u> (classroom observation using the Teaching Observation Concepts and Teaching Observation Proforma)
Achievement of course learning outcomes.	Faculty members	<u>Direct</u> (60% of the students achieved $\geq 70\%$ of the degree assigned to the course learning outcome).
Assessment of faculty members	Department head	<u>Direct</u> (Performance Assessment of faculty) <u>Indirect</u> (feedback from faculty and students).
Quality of learning resources	Students	<u>Direct</u> (feedback from faculty). <u>Indirect</u> (online survey at the end of the semester (Program survey, Experience survey & course evaluation) and graduates survey).
Effectiveness of teaching Strategies for Learning Outcomes.	Faculty members	<u>Direct</u> (Comments of course instructors regarding evaluation of teaching strategies for learning outcomes mentioned in course report).

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	Quality committee and department Council
Reference No.	
Date	2022

Head of Chemistry Department



Dr Moataz Morad

