



## Course Specifications

<b>Course Title:</b>	<b>Chemistry of Aromatic Compounds</b>
<b>Course Code:</b>	<b>4022142-3</b>
<b>Program:</b>	<b>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> 4 <sup>st</sup> level / 2 <sup>th</sup> year
<b>4. Pre-requisites for this course (if any):</b> Chemistry of Aromatic Compounds (4022132-3)
<b>5. Co-requisites for this course (if any):</b> not applicable

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

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	74%
2	Blended		
3	E-learning	√	26%
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	30
3	Tutorial	--
4	Others (E-learning + Exams + Office hours)	15
	<b>Total</b>	<b>67</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

The course includes definition of aromaticity, methods of nomenclature, properties, applications and preparations of different families of aromatic compounds.

### 2. Course Main Objective

By the end of this course student will be familiar with basic concepts in aromatic chemistry including classification, nomenclature, and preparation of aromatic compounds.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1	Name and classify the aromatic compounds	<b>K2</b>
1.2	Recognize the physical, chemical properties and applications of aromatic compounds.	<b>K2</b>
1.3	Explain the mechanism of reactions of aromatic compounds and their	<b>K1</b>

CLOs		Aligned PLOs
	interconversions based on the theoretical background.	
<b>2</b>	<b>Skills :</b>	
2.1	Apply the IUPAC rules for nomenclature of all aromatic compounds	<b>S1</b>
2.2	Predict the expected product and mechanism of different reactions of aromatic compounds.	<b>S2</b>
2.3	Explain the different strategies for preparation of aromatic compounds	<b>S1</b>
2.4	Practice chemical processes and techniques for identification and investigation of aromatic compounds.	<b>S3</b>
2.5	Use computers and internet to find all information related to aromatic compounds and their applications	<b>S5</b>
<b>3</b>	<b>Values:</b>	
3.1	Write and present a chemical report related to aromatic chemistry.	<b>V2</b>
3.2	work individually and in a team to perform a specific experiment or preparing a report on the aromatic chemistry	<b>V3</b>

### C. Course Content

No	List of Topics	Contact Hours
.1	Introduction to aromatic chemistry: benzene structure, aromaticity rule, classification of aromatic compounds and importance of aromatic compounds in our life	1+1E =2
.2	Benzene: structure (kekule's theory and MO theory), physical properties, nomenclature of mono, di and polysubstituted benzene derivatives (common and IUPAC names)	2
.3	Chemical Reactions of benzene: electrophilic substitution reactions (examples and S <sub>E</sub> Ar mechanism) and directing group effect in second substitution	1+1E =2
.4	Alkyl benzenes: Nomenclature, methods of preparation and economic importance	1E
.5	Chemical reactions of alkyl benzenes: electrophilic substitution reactions, free radical halogenation and oxidation	2
.6	Alkenyl benzenes: Nomenclature, methods of preparation and economic importance	1E
.7	Chemical reactions of alkenyl benzenes: electrophilic substitution reactions, halogenation and oxidation	2
.8	Aryl halides: structure, nomenclature (common and IUPAC names) and methods of preparation of aryl halides and organometallic compounds (Grignard Reagents,...etc.)	1+1E =2
.9	Chemical reactions of aryl halides: electrophilic aromatic substitution reactions and Nucleophilic aromatic substitution reaction (addition-elimination mechanism and addition-elimination mechanism)	2
10	Phenols and aromatic ethers: structure, nomenclature (common and IUPAC names) and methods of preparation.	1E
11	Chemical reactions of phenols and aromatic ethers, acidity of phenols, electrophilic aromatic substitution and synthetic importance and applications.	2
12	Aromatic carbonyl compounds: structure, nomenclature (common and IUPAC names) and methods of preparation of aromatic aldehydes and ketones	1E

13	Chemical reactions of aromatic carbonyl compounds: electrophilic aromatic substitution, addition to carbonyl group, condensation, reduction, oxidation, Cannizzaro's reaction and reactions of $\alpha$ -hydrogen atoms (haloform and aldol condensation, ...etc).	4
14	Aromatic carboxylic acids: structure, nomenclature (common and IUPAC names) and methods of preparation.	1E
15	Chemical reactions of carboxylic acids: electrophilic aromatic substitution, acidity, halogenation, esterification reactions and derivatives of carboxylic acids	2
16	Aromatic sulfonic acids: structure, nomenclature (common and IUPAC names), methods of preparation and reactions	1
17	Aromatic amines: structure, nomenclature (common and IUPAC names) and methods of preparation.	1
18	Chemical reactions of aromatic amines: Basicity, electrophilic aromatic substitution, alkylation, acetylation, reaction with nitrous acid, and Heinsberg's reaction	1
<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 and Understanding</b>		
1.1	Name and classify the aromatic compounds	Lectures	Mid-term and Final exams.
1.2	Recognize the physical, chemical properties and applications of aromatic compounds.	Lectures Lab work E-learning	Mid-term and Final exams. Practical Lab exam Assignments and activities on blackboard
1.3	Explain the mechanism of reactions of aromatic compounds and their interconversions based on the theoretical background.	Lectures	Mid-term and Final exams.
<b>2.0</b>	<b>Skills</b>		
2.1	Apply the IUPAC rules for nomenclature of all aromatic compounds	Lectures Web based study.	Mid-term and Final exams.
2.2	Predict the expected product and mechanism of different reactions of aromatic compounds.	Lectures	Mid-term and Final exams.
2.3	Explain the different strategies for preparation of aromatic compounds	E-Learning Mind Mapping	Assignments and activities on blackboard
2.4	Practice chemical processes and techniques for identification and investigation of aromatic compounds.	Lab work	Practical Lab exam
2.5	Use computers and internet to find all	Self-Directed	Assignments and

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	information related to aromatic compounds and their applications	Private Study	activities on blackboard
<b>3.0</b>	<b>Values</b>		
3.1	Write and present a chemical report related to aromatic chemistry.	Lab work	Practical Lab Report and Exam
3.2	work individually and in a team to perform a specific experiment or preparing a report on the aromatic chemistry	Lab work	Practical Lab Report and Exam

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	E-Learning	All weeks	5%
2	Assignments and activities	All weeks	5%
3	Mid-term Exam	6	20%
4	Practical Lab Work (Reports and Exams)	11	30%
5	Final Exam.(2 hours exam)	12	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 :**

- A faculty member was assigned to provide counseling and advice (about 20-25 student/ one faculty member).  
Office hours of the instructor: during the working hours weekly.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	John McMurry's " <i>Organic Chemistry, 8<sup>th</sup> edition, International Edition</i> " 2011, Brooks/Cole.
<b>Essential References Materials</b>	<ol style="list-style-type: none"> <li>1. Amit Arora "<i>Introductory Organic Chemistry</i>" 2006, Discovery Publishing House New Delhi</li> <li>2. John McMurry's "<i>Organic Chemistry, 8<sup>th</sup> edition, International Edition</i>" 2011, Brooks/Cole.</li> <li>3. T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder "<i>Organic Chemistry, 11<sup>th</sup> Edition, International Student Version</i>" 2013, John Wiley &amp; Sons.</li> </ol>
<b>Electronic Materials</b>	<ul style="list-style-type: none"> <li>• Lecture Hand-out available as a PowerPoint presentation.</li> <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>	
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## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom with capacity of (30) students. A laboratory with capacity of (15) students Including all practical facilities
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Teaching halls and laboratories are equipped with data show.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	See attached list

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Program leader, curriculum committee; external reviewers	Direct
Extent of achievement of CLO's	Peer Reviewer	Direct
Quality of learning resources	Students, faculty members and External reviewers	Direct

**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

<b>Council / Committee</b>	Quality committee and department counsel
<b>Reference No.</b>	
<b>Date</b>	2022

**Head of Chemistry Department**



**Dr Moataz Morad**

