



T-104  
2022

## Course Specification



Course Title:	<b>Organic Reactions Mechanisms</b>
Course Code:	<b>335 CHEM-3</b>
Program:	<b>Bachelor in Chemistry</b>
Department:	<b>Chemistry</b>
College:	<b>College of Science</b>
Institution:	<b>Jazan University (JU)</b>
Version:	<b>T104 2022</b>
Last Revision Date:	<b>28 December 2022</b>



## Table of Contents:

Content	Page
<b>A. General information about the course: .....</b>	<b>3</b>
1. Teaching mode (mark all that apply) .....	4
2. Contact Hours (based on the academic semester) .....	4
<b>B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods .....</b>	<b>5</b>
<b>C. Course Content .....</b>	<b>6</b>
<b>D. Students Assessment Activities .....</b>	<b>6</b>
<b>E. Learning Resources and Facilities .....</b>	<b>7</b>
1. References and Learning Resources .....	7
2. Required Facilities and equipment .....	7
<b>F. Assessment of Course Quality .....</b>	<b>8</b>
<b>G. Specification Approval Data .....</b>	<b>8</b>
<b>H. Attachments.....</b>	<b>9</b>
1- Practical Work.....	9
2- Blue Print .....	13



## A. General information about the course:

Course Identification	
1. Credit hours:	3h
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Track <input 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:	Level 8 Year 3

### 4. Course general Description

#### 1. Course Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Organic Reaction Mechanisms	335CHEM -3	2	2	3	3	8	232CHEM -2

**Course objectives:** They are to identify the following.

1. Types of organic reactions.
2. Identify the factors affecting the mechanism of organic reactions.
3. Identification of substitution, elimination and addition reactions.
4. Studying the reaction mechanisms of the reactions.
5. Recognition of the role of Stereochemistry during the mechanism of reactions.

### Syllabus: A-Theoretical contents

A general introduction to the mechanics of organic reactions - include (atomic orbitals - the bonds in organic compounds - properties of organic reactions) Classification of organic reactions - Electrophilic substitution in aromatic systems, Nucleophilic substitution reaction (SN1, SN2) on saturated carbon atom; mechanistic pathways, nature of the transition state and relative reactivity, Elimination reaction (E1, E2); mechanistic pathways, nature of the transition state and relative reactivity, rearrangement reactions, Addition reactions on carbonyl group, Addition reactions at (C=C) double bond, Name reactions.



### Syllabus\*: B-Practical contents

**Selected experiments related to the course topics.**

\*See attachment

**5. Pre-requirements for this course (if any): 232 CHEM-3**

**6. Co- requirements for this course (if any):None**

### 7. Course Main Objective(s)

This course aims to expertise students, types of reactions and their basic principles of organic reactions mechanisms (atomic orbitals-the bonds in organic compounds - properties of organic reactions) etc...

### 1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> <li>E-learning</li> </ul>		
4.	Distance learning		

### 2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	22
2.	Laboratory/Studio	
3.	Field	22
4.	Tutorial	
5.	Others (specify)	
	<b>Total</b>	<b>44</b>

## 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; (Upon completion of the course, student will be able to)			
1.1	Demonstrate abroad knowledge and understanding in, fundamental principles of organic chemistry that include chemical bonding, breaking of a covalent bond, stereochemistry, chemical reactions and mechanism. (P)	K (1.1)	lecture / discussion / Seminars / presentation	Objective question
1.2	Describe the synthesis and analysis of organic reaction mechanisms and their products. (P)	K (1.2)	lecture / discussion / Seminars / presentation	Objective question
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills required to Predict the reactivity of an organic compound from its structure and explain the multi-step synthesis of organic compounds. (P)	S (2.1)	lecture / discussion / Seminars / presentation	Objective question
2.2	Perform experiments as well as accurately record and analyze the results of such experiments. (P)	S (2.2)	Lab work, group work	Objective question, Essay question, 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)	S (2.3)	lab demonstrations / hands-on student learning activities	Safety exam
3.0	Values, autonomy, and responsibility; (Upon completion of the course, student will be able to)			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	Working as a group leader or a member of a team. (I)	V (3.1)	lab demonstrations / whole group and small group discussion	Practical group work Rubric

## C. Course Content

No	List of Topics	Contact Hours
1.	A general introduction to the mechanics of organic reactions – include (atomic orbitals - the bonds in organic compounds - properties of organic reactions).	3
2.	Electrophilic substitution in aromatic systems.	3
3.	Nucleophilic substitution reaction (SN1, SN2) on saturated carbon atom; mechanistic pathways, nature of the transition state and relative reactivity.	4
4.	Elimination reaction (E1, E2); mechanistic pathways, nature of the transition state and relative reactivity.	4
5.	Addition reactions on carbonyl group.	2
6.	Addition of double bond.	2
7.	Introduction to rearrangement reactions.	2
8.	Name reactions.	2
	Experimental Part	22
Total		44

## D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework assignment	3-8	2%
2.	Lecture Quizzes	5-7	3%
3.	Mid-term exam	6-8	15%
4.	LAB Sheet	11	5%
5.	Quiz in Safety	11	4%
6.	Final practical exam	11	7%
7.	Lab report	Through Semester	10%



No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
8.	<b>Group work evaluation</b>	<b>Through Semester</b>	<b>4%</b>
9.	<b>Final Exam</b>	<b>12-14</b>	<b>50%</b>
	<b>Total</b>		<b>100%</b>

\*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	1- Peter sykes/ A guide book to the mechanism in organic chemistry. 2- Jerry March / Advanced organic chemistry- Reactions, Mechanisms, Structures. 3- Organic Reactions, Larry E. Overman, John Wiley & Sons, 2002. 4- Organic Reaction Mechanisms, Gallego, Techmedia, 2004 5- Advanced Organic Chemistry: Part A: Structure And Mechanisms, Carey, Springer Verlag Gmgh , 2007.
Supportive References	1- A Guidebook to Mechanism in Organic Chemistry, Peter Sykes Third Edition, longman U.K., (1996). 2- Understanding Organic Reaction Mechanisms, Adam Jacobs, Cambridge University Press, 1997.
Electronic Materials	<a href="https://doi.org/10.1036/1097-8542.475400">https://doi.org/10.1036/1097-8542.475400</a> <a href="https://app.knovel.com/web/toc.v/cid:kpAOCRM002/viewerType:toc/">https://app.knovel.com/web/toc.v/cid:kpAOCRM002/viewerType:toc/</a>
Other Learning Materials	<ul style="list-style-type: none"> <li>• Computer-based programs/ ChemDraw</li> <li>• <a href="http://en.wikipedia.org/">http://en.wikipedia.org/</a></li> <li>• <a href="http://www.chemhelper.com/mechanisms.html">http://www.chemhelper.com/mechanisms.html</a></li> <li>• <a href="https://chem.libretexts.org/Special:Search?qid=&amp;fpid=230&amp;fpth=&amp;query=organic+reaction+mechanism&amp;type=wiki">https://chem.libretexts.org/Special:Search?qid=&amp;fpid=230&amp;fpth=&amp;query=organic+reaction+mechanism&amp;type=wiki</a></li> </ul>

### 2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms capacity (30) students. Lab capacity (15) students.
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet.
Other equipment (depending on the nature of the specialty)	Chemical Models, scientific videos



## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	<i>Student</i>	<i>Likert-type Survey (CES)</i> <i>Indirect</i>
Effectiveness of student's assessment	<i>Instructor &amp; Course coordinator</i>	Class room evaluation (direct and indirect)
Quality of learning resources	<i>Program committee</i>	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

**Assessor** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval Data

COUNCIL /COMMITTEE	Chemistry Department Council <b>CHEMS2301</b>
REFERENCE NO.	<b>CHEMS230104</b>
DATE	<b>11/1/2023G – 18/06/1444H</b>





## H. Attachments

### 1- Practical Work

No.	List of Topics	APPARATUS	CHEMICALS	Week	Contact Hrs
1	Introduction of course 1- Definition of safety in the laboratory 2- Identification of Carboxylic acid organic compounds 3- Identification of carbohydrate. 4- Identification of hydrocarbon. 5- Identification of phenols, 6- Identification of salts of acid (amm. And metallic) 7- Identification of Base	Flame distilled water - test tubes - Beaker- flask	Carboxylic acids, carbohydrates, phenols, Base, HCl, NaOH, Na <sub>2</sub> CO <sub>3</sub>	1	2
2	Acid + Acid mixture	Filter paper Glass (Beakers- Separating funnel- Conical Flask- Test Tube - Glass plate measuring cylinder.	Aliphatic acid (Oxalic acid- Tartaric acid- Citric acid- Succinic acid-) -Aromatic acid (Benzoic acid- Phthalic acid- Salicylic acid- Phenyl acetic acid cinnamic acid) Regent (CaCl <sub>2</sub> -FeCl <sub>3</sub> - NH <sub>4</sub> OH, NaOH KMnO <sub>4</sub> , H <sub>2</sub> SO <sub>4</sub> , Con. HCl, NaHCO <sub>3</sub> , Na <sub>2</sub> CO <sub>3</sub> Resorcinol- ethanol, methanol.	1	2
3	Acid + Phenols	Filter paper Glass (Beakers- Separating funnel- Conical Flask- Test Tube - Glass plate measuring cylinder.	Aliphatic acid (Oxalic acid- Tartaric acid- Citric acid- Succinic acid-) -Aromatic acid (Benzoic acid- Phthalic acid- Salicylic acid- Phenyl acetic acid cinnamic acid) -Phenol soluble in water (catechol- Hydro quinone, resorcinol- pyrogallol -Phenols insoluble water (1- naphthol-2- naphthol) -Regent (CaCl <sub>2</sub> -FeCl <sub>3</sub> - NH <sub>4</sub> OH- NaOH, KMnO <sub>4</sub> - H <sub>2</sub> SO <sub>4</sub> - Con. HCl- NaHCO <sub>3</sub> - Na <sub>2</sub> CO <sub>3</sub> - Resorcinol-	1	2





			Phenol- filter paperethanol- methanol		
4	Acid + Phenols	Filter paper Glass (Beakers- Separating funnel- Conical Flask-Test Tube - Glass plate measuring cylinder.	-Aliphatic acid (Oxalic acid-Tartaric acid- Citric acid-Succinic acid) - Aromatic acid(Benzoic acid-Phthalic acid- Salicylic acid-Phenyl acetic acid cinnamic acid.) -Phenol soluble in water (catechol-quinolresorcinol-Pyrogallol-Phenols insoluble water(1-naphthol-2- naphthol) - Regent(CaCl <sub>2</sub> -FeCl <sub>3</sub> -H <sub>4</sub> OH- NaOHKMnO <sub>4</sub> -H <sub>2</sub> SO <sub>4</sub> - Con.HCl-NaHCO <sub>3</sub> -Na <sub>2</sub> CO <sub>3</sub> - Resoncenol- Phenol.	1	2
5	Base + Phenol mixture	Filter paper Glass (Beakers- Separating funnel-Conical Flask-Test Tube - Glass plate, measuring cylinder.	Phenol soluble in water (catecholquinol-resorcinol-pyrogallol - Phenols insoluble water (1-naphthol-2- naphthol)- Base(p-Toulidine-1-naphthylamine-2-naphthylamine) - Regent (CaCl <sub>2</sub> -FeCl <sub>3</sub> -NH <sub>4</sub> OH, NaOH- KMnO <sub>4</sub> -H <sub>2</sub> SO <sub>4</sub> - Con.HCl-NaHCO <sub>3</sub> -Na <sub>2</sub> CO <sub>3</sub> - Resorcinol-Phenol.	1	2
6	Acid + Neutral mixture	Filter paper Glass (Beakers- Separating funnel-Conical Flask-Test Tube - Glass plate, measuring cylinder.	Aliphatic acid (Oxalic acid-Tartaric acid- Citric acid-Succinic acid-) -Aromatic acid (Benzoic acid-Phthalic acid- Salicylic acid-Phenyl acetic acid cinnamicacid)- Carbohydrate (Glucose-Galatose- Fructose-Lactose-Maltose-Starch-Sucrose)- Hydrocarbons (naphthane-Ancerthane) - Salts of metallic and Salts of ammonium) -Regent (CaCl <sub>2</sub> -FeCl <sub>3</sub> -NH <sub>4</sub> OH-NaOHKMnO <sub>4</sub> -H <sub>2</sub> SO <sub>4</sub> -Con. HCl-NaHCO <sub>3</sub> -Na <sub>2</sub> CO <sub>3</sub> - Resorcinol-	1	2





			Phenol-1-naphthol-Feling reagents-Berford Regent-picric acid- acetone-ethanol.		
7	Base + Neutral mixture	Filter paper Glass (Beakers- Separating funnel-Conical Flask-Test Tube - Glass plate, measuring cylinder.	Carbohydrate (Glucose-Galatose-Fructose-Lactose-Maltose-Starch-Sucrose) - Hydrocarbons(naphthane-Anthracene) -Salts of metallic and Salts of ammonium )-Base (p-Toulidine-1-naphthylamine-2-naphthylamine) - Regent (CaCl <sub>2</sub> -FeCl <sub>3</sub> -NH <sub>4</sub> OHNaOH- KMnO <sub>4</sub> -H <sub>2</sub> SO <sub>4</sub> -Con. HCl- NaHCO <sub>3</sub> -Na <sub>2</sub> CO <sub>3</sub> - Resorcinol-Phenol, ethanol-methanol.	1	2
8	Phenol + Neutral mixture	Filter paper Glass (Beakers- Separating funnel-Conical Flask-Test Tube - Glass plate, measuring cylinder.	Phenol soluble in water (catechol-quinolresorcinol-Pyrogallol- -Phenols insoluble water(1-naphthol-2-naphthol) - Carbohydrate (Glucose-Galatose-Fructose-Lactose-Maltose-Starch- Sucrose) - Hydrocarbons(naphthane-Ancerthane) -Salts of metallic and Salts of ammonium )- - Regent (CaCl <sub>2</sub> -FeCl <sub>3</sub> -NH <sub>4</sub> OHNaOH- KMnO <sub>4</sub> -H <sub>2</sub> SO <sub>4</sub> -Con. HCl- NaHCO <sub>3</sub> -Na <sub>2</sub> CO <sub>3</sub> - Resorcinol-Phenol -ethanol-methanol.	2	4
9	Neutral + Neural mixture	Filter paper Glass (Beakers- Separating funnel-Conical Flask-Test Tube - Glass	Carbohydrate (Glucose-Galatose-Fructose-Lactose-Maltose-Starch-Sucrose) -Hydrocarbons (naphthalene-Anthracene) -Salts of	2	4



		plate measuring cylinder.	metal lic and Salts of ammonium) -Regent (CaCl <sub>2</sub> -FeCl <sub>3</sub> - NH <sub>4</sub> OH-NaOHKMnO <sub>4</sub> - H <sub>2</sub> SO <sub>4</sub> -Con. HCl-NaHCO <sub>3</sub> - Na <sub>2</sub> CO <sub>3</sub> - Resorcinol- Phenol- ethanol- methanol.		
10	Final exam			11	22



## 2- Blue Print

Course Name	Organic Reactions Mechanism
Course Code	335 CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	--	3.1	--
Marks	15	21	34	22	4	--	4	--

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (15 M)	Mid term	Objective question	1	5	5
			Final Exam	Objective question	1	10	10
	K2	1.2 (21 M)	Quiz	Objective question	2	2	2
			Homework	Solving Problems	3	1	1
			Mid term	Objective question	2	5	5
			Final Exam	Objective question	2	13	13
Skills	S1	1.2 (34M)	Midterm	Objective question	2	5	5
			Quiz	Objective question	1	1	1
			Homework	Solving Problems	4	1	1
			Final Exam	Objective question	3	27	27
	S2	2.2 (22 M)	Practical Sheet	Objective question	3	5	5
			Lab Report	10 EXP.	---	10	10
			Final Lab Exam	Task	7	7	7
	S3	2.3 (4 M)	Safety EXAM	Objective question	8	4	4
Value	V1	3.1 (4 M)	Continuous assessment	Group evaluation rubric	-	4	4
TOTAL		100					100

