Course Specification
(Bachelor)

Course Title:	Organic Reactions Mechanisms
Course Code:	335 CHEM-3
Program:	Bachelor of Science in Chemistry
Department:	Chemistry
College:	Jazan University (JU)
Institution:	Jazan University (JU)
Version:	TP 153 2024
Last Revision Date:	5/05 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3h)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		

3. Level/year at which this course is offered: (Level 6 // year 3)

4. Course general 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*	*6*	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 rection 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.

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

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6. Co-requisites 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...

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60

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)			
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).*	4
2.	*Electrophilic substitution in aromatic systems.*	5
3.	*Nucleophilic substitution reaction (SN1, SN2) on saturated carbon atom; mechanistic pathways, nature of the transition state and relative reactivity.*	5
4.	*Elimination reaction (E1, E2); mechanistic pathways, nature of the transition state and relative reactivity.*	4
5.	*Addition reactions double bond.*	3
6.	*Addition of carbonyl group.*	4
7.	*Introduction to rearrangement reactions.*	2
8.	*Name reactions.*	3
9	*Experimental Part*	30
Total		60

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***	9-12	15%
4.	***LAB Sheet***	15	5%
5.	***Quiz in Safety***	15	4%
6.	***Final practical exam***	15	7%
7.	***Lab report***	Through Semester	10%
8.	***Group work evaluation***	Through Semester	4%
9.	***Final Exam***	16-17	50%

*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	https://doi.org/10.1036/1097-8542.475400 https://app.knovel.com/web/toc.v/cid:kpAOCRM002/viewerType:toc/
Other Learning Materials	• Computer-based programs/ ChemDraw • http://en.wikipedia.org/ • http://www.chemhelper.com/mechanisms.html https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=organic+reaction+mechanism&type=wiki

2. Required Facilities and equipment

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

F. Assessment of Course Quality

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

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Psci2415
DATE	28/03/1446 Corresponding to 1 / 10 /2024

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_2CO_3	1	2
2	Acid + Acid mixture	Filter paper Glass (Beakers-Separating funnel-Conical Flask-Test Tube - Glass plate measuring cylinder.	Aliphatic acid (Oxalic acid-Tartic acid- (Citric acid-Succinic acid-) -Aromatic acid (Benzoic acid-Phthalic acid- Salicylic acid-Phenyl acetic acid cinnamic acid) Regent ($CaCl_2$-$FeCl_3$- NH_4OH, NaOH $KMnO_4$, H_2SO_4, Con. HCl, $NaHCO_3$, Na_2CO_3 Resorcinol- ethanol, methanol.	2	4
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 ($CaCl_2$-$FeCl_3$-NH_4OH-NaOH, $KMnO_4$- H_2SO_4-Con. HCl-$NaHCO_3$- Na_2CO_3-Resorcinol-Phenol- filter paperethanol-methanol	2	4

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($CaCl_2$-$FeCl_3$-H_4OH-NaOH$KMnO_4$-H_2SO_4-Con.HCl-$NaHCO_3$-Na_2CO_3-Resoncenol-Phenol.	**2**	**4**
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 ($CaCl_2$-$FeCl_3$-NH_4OH, NaOH- $KMnO_4$-H_2SO_4-Con.HCl-$NaHCO_3$-Na_2CO_3-Resorcinol-Phenol.	**2**	**4**
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 ($CaCl_2$-$FeCl_3$-NH_4OH-NaOH$KMnO_4$-H_2SO_4-Con. HCl-$NaHCO_3$- Na_2CO_3- Resorcinol-Phenol-1-naphthol-Feling regents-Berfored Regent- picric acid- acetone- ethanol.	**2**	**4**
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)	**1**	**2**

			- Regent ($CaCl_2$-$FeCl_3$- NH_4OHNaOH- $KMnO_4$-H_2SO_4- Con. HCl- $NaHCO_3$-Na_2CO_3- Resorcinol-Phenol, ethanol- methanol.		
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 ($CaCl_2$-$FeCl_3$- NH_4OHNaOH- $KMnO_4$-H_2SO_4- Con. HCl- $NaHCO_3$-Na_2CO_3- Resorcinol-Phenol -ethanol-methanol.	**1**	**2**
9	Neutral + Neural mixture	Filter paper Glass (Beakers- Separating funnel-Conical Flask-Test Tube - Glass plate measuring cylinder.	Carbohydrate (Glucose-Galatose- Fructose- Lactose-Maltose- Starch-Sucrose) -Hydrocarbons (naphthalene- Anthracene) -Salts of metal lic and Salts of ammonium) -Regent ($CaCl_2$-$FeCl_3$-NH_4OH- NaOH$KMnO_4$- H_2SO_4-Con. HCl- $NaHCO_3$- Na_2CO_3- Resorcinol- Phenol- ethanol- methanol.	**2**	**4**
10	Final exam			**15**	**30**

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