

T-104
2024

Course Specification

— (Bachelor)

Course Title: Organic Chemistry

Course Code: 172-CHM-3

Program: Preparatory year / health track

Department: Preparatory year / health track

College: Preparatory year

Institution: Najran University

Version: 17/01/2024

Last Revision Date: 17/01/2024

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

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

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

4. Course general Description:

This course is designed to give fundamental ideas of organic chemistry including physical and chemical properties of different functional groups.

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

6. Co-requisites for this course (if any):

7. Course Main Objective(s):

Upon successful completion of this course, the student will be able to:

- 1- familiarity with the fundamental principles of organic chemistry that include types of hybridization, chemical bonds in organic compounds
- 2- naming organic compounds using IUPAC system and common names.
- 3- recognizing and applying functional groups regarding their physical properties.
- 4- understanding the basic organic reactions for preparation and reactions of the related compounds.
- 5- differentiate between aromatic and non-aromatic compounds according to Huckel's rule.
- 6- Illustrating isomerism and stereochemistry of organic compounds.
- 7- Separation and purification of organic compounds and finding their physical constants.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100
2	E-learning	0	0
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom 	0	0





No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
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			
1.1	Recall the fundamental principles of organic chemistry that include types of hybridization, chemical bonds in organic compounds		Lectures	- Theoretical exams - Assignments
1.2	Recognize the nomenclature, structure, and physical properties of the different classes of organic compounds		Lectures	
1.3	Identify the type of functional groups and the type of reactions of organic compounds		Lectures	
2.0	Skills			





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Illustrate isomerism and stereochemistry of organic compounds		<ul style="list-style-type: none">- Lectures- Practical work- Group discussion	<ul style="list-style-type: none">- Laboratory exams- Work placed based assessment- Laboratory report
2.2	Determine the functional groups of various medicinal active compounds		<ul style="list-style-type: none">- Practical work- Group discussion	
2.3	Ability to name the different compounds.		<ul style="list-style-type: none">- Laboratory experiments- Group discussion	
3.0	Values, autonomy, and responsibility			
3.1	Work independently and as a part of a team during class session			

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction: <ul style="list-style-type: none"> - Definition of organic chemistry. - Structural theory. - Classification of carbon atoms. - Electronegativity and types of chemical bonds (ionic, covalent and coordinate bonds). - Electronegativity and bond polarity: types of covalent bonds - Sigma (σ-) and pi (π-) bonds: structure (bonding) of ethane, ethene, ethyne, benzene and carbonyl compounds. - Hybridization (sp^3, sp^2, sp) and geometry of carbon atoms. - Electronegativity and types of chemical bonds: (Ionic and covalent bonds). 	2
2.	Representations of Structural Formulas (Drawing Organic compounds): <ul style="list-style-type: none"> - Dot formula (Lewis structure). - Dash formula (KeKule structure). - Condensed formula. - Skeletal formula (Bond-Line). Classification of Organic compounds (Functional group): <ul style="list-style-type: none"> - Hydrocarbons. - Alkyl and aryl halides. - Alcohols, phenols and ethers. - Aliphatic and aromatic carbonyl compounds (aldehydes and ketones). - Carboxylic acids and its derivatives (acid chlorides, esters, acid anhydrides, amides, nitriles) 	2





	<ul style="list-style-type: none"> - Amines and nitro compounds. - Other families. <p>Classification of Organic compounds (Carbon skeleton):</p> <ul style="list-style-type: none"> - Aliphatic (acyclic, Cyclic), Alicyclic and aromatic compounds. - Homocyclic and Heterocyclic compounds. 	
3.	<p>Nomenclature of Organic compounds:(common and IUPAC)</p> <ul style="list-style-type: none"> - An introduction to naming organic molecules . . . A guide to understanding the names of organic compounds, including alkanes, cycloalkanes, alkenes, simple halogen compounds, alcohols, aldehydes and ketones. - More organic names . . . Explains the naming of carboxylic acids and their salts, esters, acyl chlorides, acid anhydrides, amides, nitriles, amines and amino acids. - Naming aromatic compounds . . . Looks at the special problems involved in naming compounds containing benzene rings. 	4
4.	<p>Isomerism in organic compounds . . .</p> <ul style="list-style-type: none"> - Includes structural isomerism and stereoisomerism (both geometric and optical). <p>ISOMERISM MENU</p> <ul style="list-style-type: none"> - Structural isomerism (chain, positional and functional isomers)... Explains what structural isomerism is, together with examples of the various ways that these isomers can arise. - Geometric isomerism (cis/trans- and E/Z-systems) . . . Explains how geometric isomerism arises in simple organic compounds containing carbon-carbon double bonds and cycloalkanes. - Optical isomerism (enantiomers and diastereomers) . . . Explains how to recognize optical isomerism in simple cases, and how to draw the isomers. 	4
5.	<p>Classifications of Organic reactions:</p> <ul style="list-style-type: none"> - Additions reactions. - Substitutions reactions. - Elimination reactions. - Rearrangement reactions. <p>Types of Covalent Bond Cleavage and reactive intermediates:</p> <ul style="list-style-type: none"> - Homolytic cleavage (homolysis); free radical intermediate - Heterolytic cleavage (heterolysis); ions intermediates - Carbanions and carbocations. - Nucleophiles and Electrophiles - Language of arrows: the use of curly arrows to show the movement of electron pairs or single electrons in reaction mechanisms. 	2
6.	<p>Organic acids and bases . . .</p> <ul style="list-style-type: none"> - Includes the acid strengths of carboxylic acids, phenols and alcohols, and the base strengths of primary amines. <p>ORGANIC ACIDS AND BASES MENU</p> <ul style="list-style-type: none"> - Organic acids . . . Explains why organic acids are acidic, and what affects their strengths. 	2



	- Organic bases . . . Explains why primary amines are basic, and what affects their strengths.	
7.	Properties, preparation and reactions of hydrocarbons (alkane, alkene and alkynes); including alkyl halides .	2
8.	Properties and reactions (nitration, sulphonation, halogenation, alkylation and acylation) of aromatic hydrocarbons .	2
9.	Properties, preparation and reactions of alcohols and ethers .	2
10.	Properties, preparation and reactions of aldehydes and ketones .	2
11.	Properties, preparation and reactions of carboxylic acids and its derivatives (ester, acid chloride, acid anhydride and amides).	2
12.	Properties, preparation and reactions of phenols .	1
13.	Properties, preparation and reactions of amines and anilines .	3
14.	<p style="text-align: center;"><u>Practical Sessions</u></p> <ul style="list-style-type: none"> - Safety Information, - Laboratory Glassware. - Laboratory Work Instructions. - Types of heating (Bunsen burner, water and oil bathes, hot plat, heating mantel,....etc). - Types of filtrations (vacuum and gravity). - Determination of physical properties (solubility, miscibility, melting and boiling points,etc). - Separation and purification techniques of organic compounds (recrystallization, sublimation, distillation, extraction,etc). - Chromatography (paper, TLC, column chromatography). 	30
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz-I	5	5
2.	Midterm exam	9	20
3.	Quiz-II	13	5
4.	Assignment	14	5
5.	Practical report	15	5
6.	Final practical exam	15	20
7.	Final theoretical exam	16-17	40
8.	Total		100

*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	<ul style="list-style-type: none"> - Organic Chemistry, by T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder-13th edition, Wiley (2022). - Organic Chemistry, by Robert Thornton Morrison, Robert Neilson Boyd, 7th edition; Prentice Hall, 2010
Supportive References	<ul style="list-style-type: none"> - Organic Chemistry, by David J. Hart, Christopher M. Hadad, Leslie E. Craine, Harold Hart, 13th Edition. - Lecture Handouts and Instructions
Electronic Materials	<ul style="list-style-type: none"> - NU e-learning web site. - www.organic-chemistry.org/. - https://www.khanacademy.org/science/organic-chemistry.
Other Learning Materials	<ul style="list-style-type: none"> - Chem Office program

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> - Suitable lecture room equipped with data show and internet and sufficient number of seats. - Suitable laboratories equipped with health and safety tools, internet and sufficient number of seats.
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> - Computers, data show, sound systems and internet.
Other equipment (depending on the nature of the specialty)	<ul style="list-style-type: none"> - Volumetric flasks (different volumes) - Conical flasks - Burets - Bunsen Burners - Hot plates - Automatic pipettes - Glass Funnels - Test Tubes and Test tube holders - Filter papers - TLC plates. - Glass columns

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Head of departments	Indirect



Assessment Areas/Issues	Assessor	Assessment Methods
	and students	Questionnaires (indirect)
Effectiveness of Students assessment	Faculty members and students	Indirect Questionnaires (indirect)
Quality of learning resources	Students	Questionnaires (Indirect)
The extent to which CLOs have been achieved	Student peer reviewer	Direct Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	

