هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification

(Bachelor)

Course Title	Principles of Organic Chemistry
Course Code:	CHM 1120
Program:	Bachelor of Science in Chemical Laboratories
Department:	Chemistry
College:	Science
Institution:	Imam Mohammed Ibn Saud Islamic University
Version:	2024- -1
Last Revision Date:	15 September 2024

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 4 (3, 3, 0)					
4 (3 Lectures, 3 Lab, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 2/ First year(Level 2/year 1)					
4. Course general Description:					
This course, Principles of Organic Chemistry, is designed for students majoring in chemical laboratories. It will cover the basics and principles of organic chemistry that help students deal with organic chemicals in terms of nomenclature, preparation, physical properties, and safety procedures. The course will introduce the students to the meaning of organic chemistry, hydrocarbons, main and common functional groups, preparations, and reactions of organic compound classes. It will also cover the structures, properties, and chemical reactivity of the various hybridization states carbon atoms can adopt in alkanes (including cycloalkanes), alkenes, and alkynes. This course will also cover different aspects of isomerism observed in organic compounds and the reactions' mechanisms (substitution, elimination, and addition).					
5. Pre-requirements for this course (if any)**:**					
General Chemistry (1) , CHM1101					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The objectives of this course are to provide chemical laboratories students with the essential skills to understand organic compounds in terms of their bonding structures and their reactivity toward reactions. By the end of completion of this course, students will be: ✓ **Identify the common and main functional groups and give the correct name of an organic compound when provided the structure of the compound.** ✓ **Give the correct structural formula of the organic compound name and vice versa.** ✓ **Illustrate basic concepts of structure and bonding in organic compounds.** ✓ **Illustrate the structure of constitutional isomerism, stereoisomerism, conformational analysis, and structural effects on organic compounds' physical and chemical properties.** ✓ **Illustrate basic concepts relating to the reactivity of organic compounds toward common reactions, such as substitution, addition, elimination, and rearrangement, to predict the product(s) of these reactions.**					

✓ **Use glassware and equipment in the organic laboratory and handle chemicals safely.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**90**	**100%**
2	E-learning	**0**	**0**
3	Hybrid • Traditional classroom • E-learning	**0**	**0**
4	Distance learning	**0**	**0**

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	**45**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		90

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe the basic principles of organic chemistry in terms of structure, physical and chemical properties, naming, reactivity,**	**K1, K3**	▪ **Six hours weekly, containing lectures and laboratory activities.**	**Direct:** • **exams, Quizzes** • **Homework Laboratory Reports** • **Participation**

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	synthesis, and environmental impact.		▪ A Private study, including a Homework	
1.2	Recognize the chemical behavior and Stereochemistry of Aliphatic Organic Compounds.	K1	▪ Three hours of weekly lectures Self-study	Direct: ✓exams, quizzes ✓Oral Discussion ✓Homework ✓Participation
1.3	List the reactivity of organic compounds toward common reactions	K1	▪ Six hours weekly containing lectures and laboratory activities. ▪ Think, talk, and list the reactivity of organic compounds	Direct: ✓exams, quizzes ✓Laboratory Reports ✓Oral Discussion
2.0	Skills			
2.1	Predict the names and products of different organic compounds and their reaction mechanisms (Alkanes & cycloalkanes, alkyl halides, alkenes, and alkynes).	S1, S2	• Introduce some Organic chemical structures to discuss and predict their properties and reactions • Brainstorming Exercises	Direct ✓ Questions in Lectures. ✓ Short Quizzes and Exams. ✓ Participation ✓ Laboratory reports
2.2	Justify chemical reactivity with chemical structure	S1,	• Group Discussions • Laboratory Experiments	Direct ✓ Questions in Lectures. ✓ Short Quizzes and Exams. ✓ Participation ✓ Laboratory reports
2.3	Differentiate between different types of isomers.	S1, S3	• Group Discussions • Brainstorming Exercises	Direct ✓ Short Quizzes and Exams. ✓ Participation ✓ Oral discussion

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.4	Use laboratory instruments and perform chemical experiments during laboratory Class field tasks.	S1, S2, S4	• Group Discussions and Laboratory Experiments	Direct: ✓ Laboratory report Marks. ✓ Discussion marks ✓ Participation ✓ Oral discussion
3.0	Values, autonomy, and responsibility			
3.1	Appraise teamwork and create awareness to maintain scientific integrity during assessments, projects, and mini-projects.	V2	• Group discussion, assignments, and homework • Lab-reports Virtual labs and demonstrations	Direct ✓Oral tests, ✓lab performance, ✓Lab-reports, ✓Sheets Marks ✓Assignments and homework marks ✓Mini projects
3.2	Show personal values and attributes such as honesty, empathy and respect for others	V1, V2	• Teamwork and class discussions	Direct ✓ lab reports ✓Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Study of Organic Chemistry:** What is organic Chemistry, and why do we study it?, Electronic Structure and bonding of hydrogen, carbon, oxygen, and nitrogen; Sp^3, Sp^2, and Sp hybridization in carbon bonding. Drawing chemical structures: condensed structures and skeletal structures.	3
2.	**Polar covalent bonds and Organic acids and bases:** differences among ionic, covalent, and polar covalent bonds; Formal charges; Resonances; acid-bases pH and pK_a; Predicting Acid-Base Reactions from pK_a Values; organic acids and organic bases. .	3
3.	**Organic Compounds:** Functional groups; Alkanes and Alkane Isomers; Alkyl Groups; Naming Alkanes; Properties of Alkanes; Conformation of	6

	some alkanes. Naming of cycloalkanes; Cis–Trans Isomerism in Cycloalkanes; conformation cycloalkanes.	
4.	**Alkenes:** Calculation of degree of unsaturation; Naming alkenes; Cis–Trans Isomerism in Alkenes; E/Z configuration of alkenes; (stability of alkenes; (preparation of alkenes; (Reactions of alkenes;	**3**
5.	**Alkynes: Naming and Reactions:** Nomenclature of Alkynes; Preparation of Alkynes; (Reactions of Alkynes; Introduction to Organic synthesis.	**3**
6.	**Alkyl Halides (Organohalides):** Names and Structures of Alkyl Halides; Preparing Alkyl Halides from Alkanes; Preparing Alkyl Halides from Alkenes; Preparing Alkyl Halides from Alcohols; Reactions of Alkyl Halides: Grignard Reagents; Oxidation and Reduction in Organic Chemistry.	**6**
7.	**Alcohols and Phenols:** Naming Alcohols and Phenols; Properties of Alcohols and Phenols Preparation of Alcohols; Reactions of Alcohols; Phenols and Their Uses Reactions of Phenols	**3**
8.	**Ethers and Epoxides; Thiols and Sulfides:** Names and Properties of Ethers; Preparing Ethers; Cyclic Ethers: Epoxides; Reactions of Ethers and Epoxides; Thiols and Sulfides	**3**
9.	**Carbonyl compounds:** Kinds of Carbonyl compounds; Nature of the Carbonyl Group; General Reactions of Carbonyl compounds	**3**
10.	**Aldehydes and Ketones:** Naming Aldehydes and Ketones; Preparing Aldehydes and Ketones; Reactions of Aldehydes and Ketones; nucleophilic addition reaction, addition of HCN, formation of imines, Schiff bases, and enamines, reaction with hydrazine and base, …etc.)	**6**
11.	**Carboxylic Acids and Nitriles:** Naming Carboxylic Acids and Nitriles; Structure and Properties of Carboxylic Acids Preparing Carboxylic Acids; Reactions of Carboxylic Acids: An Overview; Chemistry of Nitriles.	**3**
12.	**Review**	**3**
Total		**45**
Laboratory Topics		
Lab 01	**Laboratory instructions and the laboratory rules.**	**3**
Lab 02	**Filtration, Decolonization, Drying and drying agents, Reflux, Reporting results.**	**3**
Lab 03	**Identification of Organic Compounds; Physical Character, Solubility, Melting Points, Boiling Points. (Physical Properties).**	**3**

Lab 04	Re-crystallization	3
Lab 05	Chromatography (Thin Layer Chromatography)	3
Lab 06	Distillation	3
Lab 07	Classification of organic compounds, Identification of Aromatic and aliphatic hydrocarbons	3
Lab 08	Differentiation between alkane, alkene	3
Lab 09	Identifications and differentiation of alcohol (primary, secondary, tertiary alcohols) and Phenols	3
Lab 10	Identification and differentiation of Phenols	3
Lab 11	Identification and differentiation of aldehydes and ketones	3
Lab 12	Identification and differentiation of carboxylic acid as aromatic and aliphatic	3
Lab 13	Identification and differentiation of amines	3
Lab 14	Review and Lab. Reports overview	6
	Total	45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	6th/ 7th week	10 %
2.	Midterm 2	11th/ 12th week	10 %
3.	Quizzes, Home Works, class participation, and mini projects	During the semester	10 %
4. .	Laboratory	All the semester	30 %

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
5	Final Exam	16thweek	40 %
6.	Total	All weeks	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	John E. McMurry**, Organic Chemistry**, Cengage Learning; 9th edition (March 25, 2015) ISBN-10 : 1305080483, ISBN-13 : 978-1305080485.
Supportive References	▪ Paula Yurkanis Bruice, **Organic Chemistry**., Pearson; 7th edition (January 8, 2013) ISBN-10 : 0321803221, ISBN-13 : 978-1269406772 ▪ Morrison, R. T.; Boyd, R. N., **Organic Chemistry**, Benjamin-Cummings Pub Co;, 6th edition, Prentice Hall of India, (1996), ISBN-10: 0136436692. ISBN-10: 0136436692, ISBN-13 : 978-0136436690 ▪ Steven F. Pedersen, Arlyn M. Myers, **Understanding the Principles of Organic Chemistry: A Laboratory Experience**, Brooks Cole; 1st edition (January 1, 2010), ISBN-10 : 0495829935, ISBN-13 : 978-0495829935 ▪ Kenneth L. Williamson, Katherine M. Masters, **Macroscale and Microscale Organic Experiments**, Cengage Learning; 7th edition (January 1, 2016), ISBN-10 : 1305577191, ISBN-13 : 978-1305577190
Electronic Materials	
Other Learning Materials	• Blackboard

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector, with a maximum of 20 students.** • **In each laboratory, a list of safety and precautions are provided.**

Items	Resources
	• In each lab has proper ventilation, and well equipped with instruments. • In each lab, containers for solid waste, liquid waste, and crushed glasses. • Each lab has a small pharmacy for first aid in case of an accident • In each lab, the rules, conditions, and safety mechanism as well list of Risk, Safety precautions according to Merck Catalogue are hanging in the labs
Technology equipment (projector, smart board, software)	The rooms are equipped with data show, Smart Board, WI-FI access.
Other equipment (depending on the nature of the specialty)	• Appropriate Glasswares for carrying the requested experiments (conical flasks, beakers, measuring cylinders) • Appropriate fine chemicals and solvents (distilled Water ammonium nitrate) Analytical balance (3 digits), Set gas laws with the glass jacket Data acquisition set for gas laws with glass jacket, PC, Windows® 95 or higher, calorimeter, thermometer, Filter papers , clamps, stands

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students assessment	**Program Leaders**	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	**Students**	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus

Assessment Areas/Issues	Assessor	Assessment Methods
	Course Responsible Program Leaders	review- Accreditation review.
The extent to which CLOs have been achieved		**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report. **Indirect:** Exams.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**3 (NO. 1/3)**
DATE	**5/3/1446- 8/09/2024**