هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**GENERAL CHEMISTRY**
Course Code:	**101CHEM-4**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**25 December 2022**

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A. General information about the course:

Course Identification

1. Credit hours:	4h
2. Course type	
a.	University ☐ College ☐ Department☒ Track☐ Others☐
b.	Required ☒ Elective☐
3. Level/year at which this course is offered:	*Level 1* *Year 1*

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
General Chemistry	*101CHEM4*	*3*	*2*	*4*	*1*	*1*	*none*

*The course of General chemistry aims to give the students some variety information about the different topics. It is meant to introduce the students to study the special chemistry courses in the next stage*s.

Course objectives: They are to identify the following.

- *Recognize the students some information about the different gas laws and their applications*
- *Recognize the students some properties of the liquids.*
- *Recognize the students, the structure of the atoms and the different atomic theories.*
- *Recognize the students the chemical bonding and its properties.*
- *Recognize the students the chemical elements and their properties from the periodic table*.

Syllabus: A-Theoretical contents

The scientific content of the theoretical part:

- *The atomic structure- Periodic table- Chemical bonds- Gases- Chemical equilibrium – Ionic equilibrium- Liquids- Introduction to organic chemistry.*

Syllabus: A-Practical contents

Identification of anions and cations of simple unknown organic salt.

5. Pre-requirements for this course (if any): *None*

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

7. Course Main Objective(s)

The course of General chemistry aims to give the students some variety information about the different branches of chemistry that needed in the next stages.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	55

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 a broad, knowledge and understanding in fundamentals of general chemistry (I)***	K(1.1)	***Lectures, Class Discussion***	***Objective Q***
1.2	***Describe the phenomenon of liquid state, boiling point, vapor pressure, surface tension, chemical equilibrium, ionic equilibrium, type of bonds and introduction to organic compounds. (I)***	K(1.2)	***Lectures, Class Discussion***	***Objective Q Essay Q***
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	***Demonstrate the gained knowledge and skills to solve problems associated with different topics in the course as, gas law, pH, chemical equilibrium, etc. (I)***	S(2.1)	***Lectures, Class Discussion***	***Solve problem***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	***Design and carry out qualitative experiments to identify different anion and cations of selected compounds (I)***	S(2.2)	***Lab work, group work***	***Lab Report.***
2.3	***Know and follow proper procedures and regulations for safe handling, use, and disposal of chemicals. (I)***	S(2.3)	***Lab Discussion***	***Safety Exam.***

C. Course Content

No	List of Topics	Contact Hours
1.	Matter and measurements	4
2.	Atoms-molecules and periodic tabled	4
3.	The electronic structure of the atoms.	4
4.	chemical bonds	4
5.	Gases	3
6.	Liquids	4
7.	Chemical equilibrium	3
8.	ionic equilibrium	3
9.	introduction to organic chemistry	4
10.	Selected experiments related to salt identification	22
	Total	55

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Homework assignment***	***2-10***	***4 %***
2.	***Lecture Quizzes***	***3-10***	***1 %***
3.	***Mid-term exam***	***6-8***	***15 %***
4.	***LAB Sheet***	***11***	***2 %***
5.	***Quiz in Safety***	***10-11***	***3%***
6.	***Final practical exam***	***11***	***15 %***
7.	***Lab report***	***2-10***	***10 %***
8.	***Final Exam***	12-***13***	***50 %***
	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	Principles of general chemistry, Remond Chang., Obeikan Library, August, 2014.
Supportive References	• Principles and Applications of general chemistry, Remond Chang.chemistry.com.pk/books/chemistry (10th Edition), 2017. • Introduction to organic chemistry, (7th Edition) written by Mark Weller, Tina Overton, Jonathan Rourke and Fraser Armstrong, Published by chemistry.com.pk. November 17, 2020 Introduction to physical chemistry, David Ronis, published by McGill University, 2015.
Electronic Materials	Simplify of general chemistry, Saeed Abdullah Balubaid, (1st Edition), King Saud University, 2006.
Other Learning Materials	https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=general+chemistry&type=wiki https://chemistry.com.pk/books/inorganic-chemistry-6e-by-shriver-weller-overton-rourke-armstrong/ https://chemistry.com.pk/books/chemistry-10e-by-zumdahl-and-decoste/

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, demonstration rooms/labs, etc.)	1 Lecture room for groups of 50 students. 1 Laboratory for group of 25 students
Technology equipment (AV, data show, Smart Board, software, etc.)	Data show, smart Board, ChemDraw, power point and ActivInspire
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Chemical reagents, test tubes, pipette and dis. Water.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Teaching and Assessment	Student	Liker-type Survey (CES) Indirect
Extent of achievement of course learning outcomes	Instructor & Course coordinator	Class room evaluation (direct & indirect)
Quality of learning resources	Program coordinator	Indirect
Exam Quality assessment	Assessment committee	Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Teaching and Assessment	Student	Liker-type Survey (CES) Indirect

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)

G. Specification Approval Data

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

H. Attachments

1- Practical Work

Week	EXPERMENTAL TITLE	Chemicals and Apparatus used	Remarks
1	Safety and regulations	Tubes, pipet, beakers, bottles,…etc	
2	Experiment no. 1 Group 1 acidic radical	Dil HCl, CO_3^{--}, HCO_3^{-}, $S_2O_3^{--}$, $BaCl_2$, $MgSO_4$	

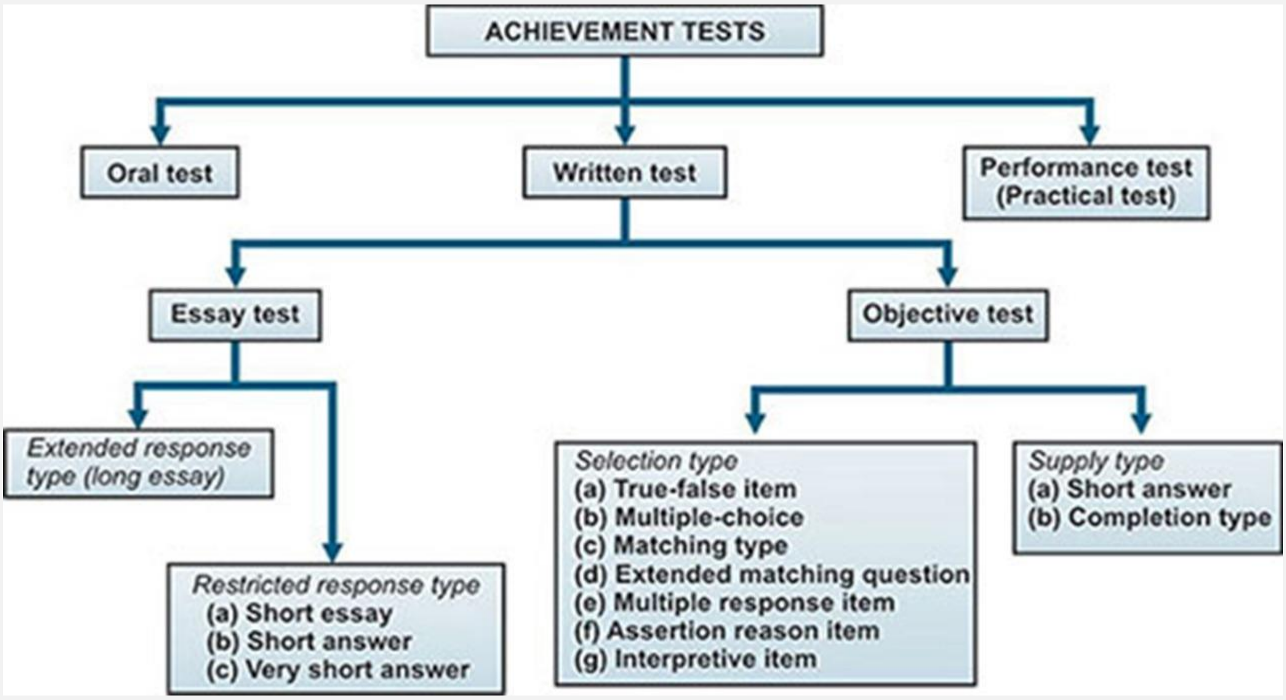
3	***Experiment no. 2*** Group 2 acidic radical	Conc. H_2SO_4, Cl^-, Br^-, I^-, NO_3^-, $AgNO_3$, $Pb(CH_3COO)_2$	
4	***Experiment no. 3*** Group 3 acidic radical	$BaCl_2$, $AgNO_3$, SO_4^{--}, $B_4O_7^{--}$, PO_4^{---}	
5	***Experiment no. 4*** Group 1 basic radical	Pb^{+2}, dil HCl, KI, K_2CrO_4	
6	***Experiment no. 5*** Group 2 basic radical	Cu^{+2}, $Cd^{+2,}$ Bi^{+3}, dil HCl, H_2S,NaOH, NH_4OH	
7	***Experiment no. 6*** Group 3 basic radical	Al^{+3}, Fe^{+3}, Fe^{+2}, Cr^{+3}, NaOH, NH_4OH, NH_4Cl.	
8	***Experiment no. 7*** Group 4 basic radical	Zn^{+2}, Mn^{+2}, Co^{+2}, Ni^{+2}, NaOH, NH_4OH, NH_4Cl, H_2S, $K_3[Fe(CN)_6]$	
9	***Experiment no. 8*** Group 5 basic radical	Ca^{+2}, Sr^{+2}, Ba^{+2}, NaOH, NH_4OH, NH_4Cl,($NH_4)_2CO_3$, K_2CrO_4, $K_2Cr_2O_7$	
10	***Experiment no. 9*** Group 6 basic radical Group 6 basic radical	Na^+, K^+, Mg^{+2}, NH_4^+, NaOH, NH_4OH, NH_4Cl, ($NH_4)_2CO_3$,	
11	***Final practical exam***		

2- Blue Print

Course Name	General Chemistry
Course Code	101 CHEM-4

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	40	20	10	27	3	--	--	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (40M)	Homework 1	Objective Q & Essay Q	10	2	2
			Mid term	Objective Q & Essay Q	18	9	9
			Final Exam	Objective Q & Essay Q	29	29	29
	K2	1.2 (20M)	Homework 2	Objective Q & Essay Q	10	2	2
			Mid term	Objective Q & Essay Q	8	4	4
			Final Exam	Objective Q & Essay Q	14	14	14
Skills	S1	2.1 (10M)	Quiz 1	Solving Problems	5	1	1
			Mid term	Solving Problems	4	2	2
			Final Exam	Solving Problems	7	7	7
	S2	2.2 (27M)	Practical Sheet	Objective Q	5	2	2
			Lab Report	Rubric	10	10	10
			Final Lab Exam	Rubric	2	15	15
	S3	2.3 (3M)	Safety Quiz	Objective Q	6	3	3
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**General and Physical Chemistry**
Course Code:	**201CHEM4**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**31 December 2022**

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A. General information about the course:

Course Identification	
1. Credit hours:	4h
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered:	*Level 3* *Year 1*

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
General and Physical Chemistry	*201CHEM4*	*3*	*2*	*4*	*1*	*3*	*101CHEM4*

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

1 - Identification of the laws of thermal chemistry and its various applications.

2 - Identify the types of solutions

3 - Identification of the laws of thermodynamics, and their various functions.

4 - Identify the different forms of energy, and the possibility of turning any of them to other forms.

5 - Identification of chemical contaminants and methods of monitoring, and disposal

***Syllabus**: A-Theoretical contents*

Study Thermochemistry and thermodynamics, Solutions, Chemical kinetics, Redox reactions and Electrochemistry, Acids and bases, Atomic and Molecular Structure, Chemistry and Ecology.

Syllabus: B-Practical contents

Selected experiments in Identification the basic radicals of inorganic salts mixtures.

*See attachment

5. Pre-requirements for this course (if any): *101CHEM*

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

7. Course Main Objective(s)

The course is designed to give the students some information about the different chemical items; Thermochemistry, Solutions, Chemical kinetics, Thermodynamics, Redox reactions and Electrochemistry, Atomic and molecular structure, Chemistry and Ecology.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	55	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	55

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 an introductory knowledge in solution, chemical kinetics, thermodynamics, oxidation -reduction….,etc . (I)	K(1.1)	***lecture / discussion Seminars /presentation***	***Objective question***
1.2	Describe the essential facts, principles and theories related to thermodynamics, kinetics, solution chemistry,….etc (I)	K(1.2)	***lecture / discussion / Seminars /Individual presentation***	Essay question
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills required to solve problems in the kinetic, colligative properties, thermodynamics, thermochemistry , ….etc (I) (P)	S(2.1)	***lecture / discussion / Seminars /Individual presentation***	Solving Problems & chart analysis

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. (I)	S(2.2)	*Lab work,*	*Objective question, Essay question,* *lab report rubric*
2.3	Examine his material and lab safety background to Follow proper procedures and regulations for safe handling and use of chemicals. (I)	S(2.3)	*lab demonstrations / hands-on student learning activities*	*Safety exam*

C. Course Content

No	List of Topics	Contact Hours
1.	Atomic and Molecular structure	6
2.	Acids and Bases	3
3.	Chemical kinetics	3
4.	Redox reactions and Electrochemistry	3
5.	Solutions	6
6.	Chemistry and Ecology	3
7.	Thermochemistry and Thermodynamics	6
8.	Revision	3
9.	Lab.	22
	Total	55

D. Students Assessment Activities

No	Assessment Activities *		Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz		4	5 %
2.	Mid term		8	15 %
3.	Safety EXAM		13	3 %
4.	Laboratory	LAB Sheet	***10-12***	***10 %***
5.		Quiz in Safety	***9***	***10 %***
6.		Final practical exam	***10-12***	***7 %***
7.	Final Exam		12-14	50%
	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	الكيمياء العامة: المفاهيم الأساسية ، ريموند تشانغ ،العبيكان للنشر ,Raymond, Chang ,General Chemistry: The Essential Concepts 5th Edition 2018, ISBN-13: 978-0073311852
Supportive References	Physical Chemistry ,Peter Atkins, Julio de Paula, Julio DePaula W. H. Freeman, - 2005. - Physical Chemistry, 4th Edition Robert J. Silbey. Robert A. Alberty. Moungi G. Bawendi v. TM. Cambridge, Massachusetts. January 2004
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	https://learn.saylor.org/course/CHEM101 https://chem.libretexts.org/Bookshelves/General_Chemistry https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=physical+chemistry&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, laboratories,
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

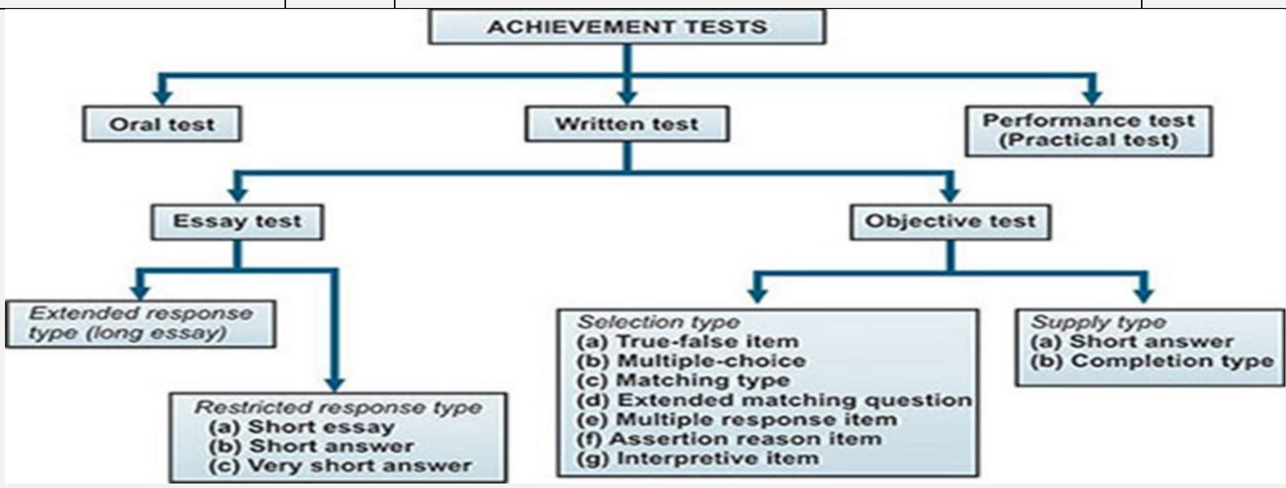
Week No.	Experiment Title	Required Chemicals	Required Glass Wear& equipment	Notes
1st	Group separation of 1st basic radical group	1st basic radical group salts, reagents.	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	
2nd	Group separation of 2nd basic radical group	2nd basic radical group salts, reagents.	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	
3rd	Group separation of 3rd basic radical group	3rd basic radical group salts, reagents.	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	
4th	Group separation of 4th basic radical group	4th basic radical group salts, reagents.	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	
5th	Group separation of 5th basic radical group	5th basic radical group salts, reagents.	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	
6th	Group separation of 6th basic radical group	6th basic radical group salts, reagents.	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	
7th to 11th	Identification Of Inorganic Mixtures	All basic radical group salts, reagents.	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	

2- Blue Print

Course Name	**General and Physical Chemistry**
Course Code	**201CHEM4**

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	25	25	20	27	3	-	-	-

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (25M)	Quiz	Objective question	4	2	2
			Mid term	Objective question	5	5	5
			Final Exam	Objective question	8	18	18
	K2	1.2 (25M)	Quiz	Objective question	2	2	2
			Mid term	Objective question	5	5	5
			Final Exam	Objective question	4	18	18
Skills	S1	2.1 (20 M)	Quiz	Solving Problems & chart analysis	2	2	1
			Mid term	Solving Problems & chart analysis	2	4	5
			Final Exam	Solving Problems & chart analysis	6	14	14
	S2	2.2 (27 M)	Practical Sheet	Objective question	10	10	10
			Lab Report	10 EXP.	10	7	7
			Final Lab Exam	Task	1	10	10
	S3	2.3 (3 M)	Safety EXAM	Objective question	6	3	3
	TOTAL	100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **Volumetric Analytical Chemistry**	
Course Code: **211CHEM -3**	
Program: **Bachelor in Chemistry**	
Department: **Chemistry**	
College: **College of Science**	
Institution **Jazan University (JU)**	
Version: **T104 2022**	
Last Revision Date: **29 December 2022**	

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	
2. Course type	
a.	University ☐ College ☐ Department☒ Track☐ Others☐
b.	Required ☒ Elective☐
3. Level/year at which this course is offered:	Level 5 Year 2nd

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Volumetric Analytical Chemistry	*211CHEM3*	*2*	*2*	*3*	*2*	*5*	*101CHEM4*

The aim of this course is to study the theoretical and practical principles of the different methods of volumetric analysis

Course objectives: They are to identify the following:

- Basic principles of volumetric analysis
- Different unites to express concentrations
- Different types of titrations and its applications
- Preparation of solutions with different concentrations

Syllabus: A-Theoretical contents
Basic principles and concepts of volumetric analysis. Different units of concentrations. Different types of titrations as neutralization, oxidation reduction, complexometric and precipitation titrations.

Syllabus: B-Practical contents
Selected experiments related to volumetric analysis

5. Pre-requirements for this course (if any): ***101CHEM4***

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

7. Course Main Objective(s)
The aim of this course is to study the theoretical and practical principles of the different methods of volumetric analysis

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad understanding and critical view of the principles, classification and application of volumetric analysis. (I)	K(1.1)	*lecture / discussion Seminars /presentation*	***Objective questions***
1.2	Describe the essential facts, principles and theories dealing with neutralization, complexities, precipitation and oxidation reduction reactions. (I)	K(1.2)	*lecture / discussion / Seminars /Individual presentation*	***Objective questions***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate ability in critical thinking, numeracy, analytical reasoning, use graphs, charts for solving problems related to volumetric analysis topics. (**I**)	S(2.1)	lecture / discussion / Seminars /Individual presentation	**Solving Problems & chart analysis & Essay questions**
2.2	Apply their experimental basics and skills to use laboratory equipment, and classical techniques for carrying out titration experiments and to write a report representing the scientific data (**I**)	S(2.2)	Lab work, group work	**Lab final exam / lab report rubric/ Objective questions**
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (**I**)	S(2.3)	lab demonstrations / hands-on student learning activities	**Safety exam**

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to analytical chemistry, types of chemical analysis, some definitions for titrimetric methods and calculation of number of moles and equivalent weight.	3
2.	Unites for expressing concentration; normality, molarity, molality, percent, w/w, w/v, v/v%, part per million, part per billion and conversion between some concentration unites.	3
3.	Dilution of solutions, solution preparation, titrations based on acid-base reactions	3

4.	Simple titration curves (strong, weak acids versus strong , weak bases) ,complicated titration curves and calculation of pH during titrations	3
5.	Theory of acid-base indicators and titrations based on oxidation reduction reactions	3
6.	Titration curves of oxidation reduction reactions and applications.	3
7.	Titrations based on complexation reactions, applications and titrations based on precipitation reaction.	3
8.	Revision	1
9.	Selected Experiments related to course topics.	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**	**4-6**	**3 %**
3.	**Mid-term exam**	**6-8**	**15 %**
4.	**LAB Sheet**	**11**	**7%**
5.	**Quiz in Safety**	**9-11**	**3%**
6.	**Final practical exam**	**11**	**10 %**
7.	**Lab report**	**Through semester**	**10 %**
8.	**Final Exam**	**12-14**	**50 %**
9.	**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	Quantitative Chemical Analysis, Daniel C. Harris, Charles A. Lucy Kate Parker publisher, 9th edition 2015.
Supportive References	Fundamentals of Analytical Chemistry" - by Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, Mary Finch publisher 9th edition 2013.
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	• https://book4you.org/book/3338575/951c19

	• https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.2%3A_Learning_Activity • https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/09_Titrimetric_Methods/9.4%3A_Redox_Titrations • https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.4%3A_Complex_ion_Equilibria_and_Complexometric_Titrations • https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=volumertric+analysis&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	*1 Lecture room(s) for groups of 50 students* *1 Lab room(s) for groups of 25 students*
Technology equipment (projector, smart board, software)	*Smart board, Data show, Black board, internet*
Other equipment (depending on the nature of the specialty)	Laboratory glassware and equipment such as erlenmeyer flasks watch glass, graduated cylinder, volumetric flask, graduated pipette, volumetric buret and beakers, water bath, magnetic stirrer, Electronic balance and hot plate

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	Classroom evaluation (direct & indirect)
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

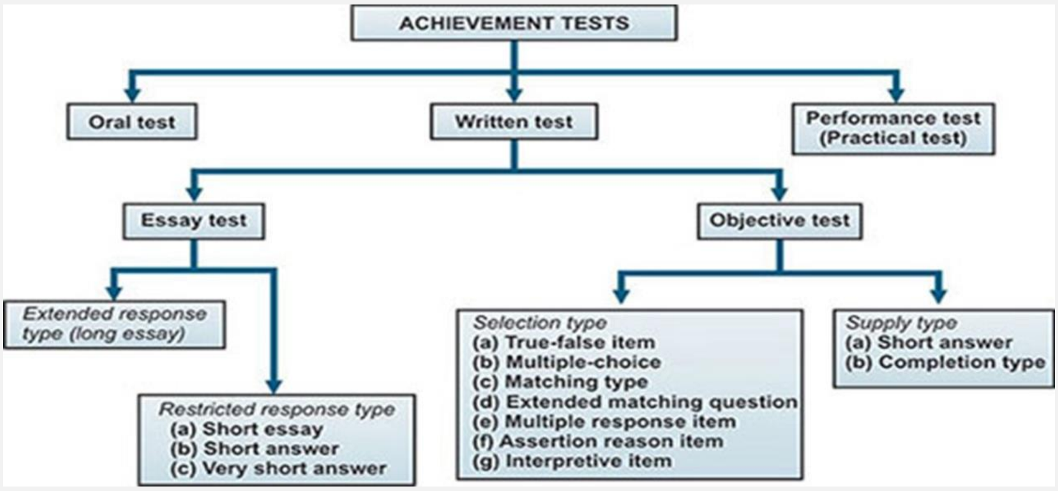
No	Title of Experiment	Tools, Chemicals, and equipment Needed in Experiments	Week
1.	**Laboratory safety**	None	1
2.	**Solution preparation**	Sodium carbonate, sodium chloride, Sulphuric Acid and hydrochloric acid	2
3.	**Determination of normality and strength of unknown sodium hydroxide solution by oxalic acid**	Sodium hydroxide, oxalic acid and phenolphthalein	3
4.	**Determination of normality and strength of unknown hydrochloric acid by solution known Sodium hydroxide**	Sodium hydroxide, hydrochloric acid, phenolphthalein and methyl orange	4
5.	**Revision**	Depending upon the selected experiment	5
6.	**Determination of normality and strength of unknown sodium carbonate solution by standardized Hydrochloric acid solution**	sodium carbonate, Hydrochloric acid, phenolphthalein and methyl orange	6
7.	**Determination of normality and strength of unknown potassium permanganate solution by standard oxalic acid solution**	potassium permanganate, oxalic acid, Sulphuric Acid	7
8.	**Determination of normality and strength of unknown ammonium ferrous sulphate solution by standard potassium dichromate solution**	potassium dichromate solution, ammonium ferrous sulphate, sulphuric acid, phosphoric acid and diphenyl amine	8
9.	**Determination normality and strength of sodium thiosulfate using standard solution of potassium dichromate (iodomeyric titration)**	Sodium thiosulphate, potassium dichromate	9
10.	**Determination normality and strength of magnisum sulphate using standard solution of EDTA (complexmetryl)**	EDTA and magnesium sulphate	10
11.	FINAL EXAM		11

2- Blue Print

Course Name	Volumetric Analytical Chemistry
Course Code	211CHEM -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	-	-	-
Marks	30	25	15	27	3	-	-	-

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (30M)	Quiz	Objective Questions	2	2	1
			Mid term	Objective Questions	3	7	7
			Final Exam	Objective Questions	5	22	22
	K2	1.2 (25M)	Quiz	Objective & Essay Questions	2	2	1
			Mid term	Objective& Essay Questions	3	6	6
			Final Exam	Objective& Essay Questions	6	18	18
Skills	S1	2.1 (15M)	H.W	Solving Problems & chart analysis & Essay questions	4	2	2
			Quiz	Solving Problems & chart analysis & Essay questions	2	2	1
			Mid term	Solving Problems & chart analysis & Essay questions	2	2	2
			Final Exam	Solving Problems & chart analysis & Essay questions	4	10	10
	S2	2.2 (27M)	Practical Sheet	Objective Questions	2	14	7
			Lab Report	Lab Report Rubric	5	10	10
			Final Lab Exam	I Task experiment	1	10	10
	S3	2.3 (3M)	Safety Quiz	Objective questions	1	6	3
	TOTAL	**100**					**100**


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Chemistry of Gravimetric Analysis**
Course Code:	**212 CHEM-3**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**5 January 2023**

Table of Contents:

Content	Page

A. General information about the course:

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 2

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Chemistry of Gravimetric Analysis	*212CHEM-3*	*2*	*2*	*3*	*2*	*6th*	*211CHEM-3*

Course objectives: They are to identify the following: -

- Basic principles, definitions, and classifications of gravimetric methods

– Theories, mechanisms, steps, and applications of precipitation gravimetry

- Gravimetric, solubility and solubility products calculations

- Types of impurities in precipitates and their minimization.

- Determination of different cations and anions using precipitation gravimetry.

Syllabus: A-Theoretical contents.

Basic principles, definitions, and classifications of gravimetric methods. Theories, mechanisms, steps, advantages, disadvantages, and applications of precipitation gravimetry. Different calculations such as gravimetric calculations, solubility, solubility products, amount of precipitating agent and pH at which precipitation start and complete. Impurities in precipitates and their minimization. Precipitation from homogeneous solutions. Evaluating Precipitation Gravimetry, Scale of operation, Accuracy, Sensitivity, and specificity of gravimetric analysis.

Syllabus: B-Practical contents.

Selected experiments related to gravimetric analysis.

5. Pre-requirements for this course (if any): 211CHEM-3

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

7. Course Main Objective(s)

The course is designed to study the basic principles and experimental applications of some gravimetric especially precipitation gravimetry.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad understanding and critical view of the principles, classificationand application of precipitation gravimetry. (I)	K(1.1)	Lecture/ discussion	Written examinations and quizzes (Objective Questions)
1.2	Describecorrectlythe essential facts, principles	K(1.2)	Lecture/ discussion	Written examinations and

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	and theories dealing with precipitation gravimetry			quizzes (Objective Questions
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate ability in critical thinking, numeracy, analytical reasoning, use graphs, charts for solving problems related to precipitation gravimetry(I)	S(2.1)	Lecture/ discussion	Written examinations, HWand quizzes (Problem-solving exercises& Essay question)
2.2	Apply their experimental basics and skills to use laboratory equipment, and classical techniques for carrying out experiments in various fields of precipitation gravimetry and to write a report representing the scientific data.(I)	S(2.2)	Lab Work/ group Work	Practical Sheet (Objective Questions, essay Question) lab report rubric& Final Lab Exam
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals(I)	S(2.3)	lab demonstrations / hands- on student learning activities	Safety exam (Objective Questions)

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction, Types of gravimetric methods, Precipitation gravimetry, Theory and Practice Steps of precipitation, gravimetry, Calculations in precipitation gravimetry, solubility and solubility products constant.	4
2.	Saturation and Super saturation, Controlling Particle Size, Relative Supper Saturation (Von Weimarn's Ratio) Mechanism of precipitants formation, Homogeneous Nucleation, , Heterogeneous Nucleation	3
3.	Precipitation methods from Homogeneous solutions, precipitates improvement factors affecting solubility of precipitates.	3
4.	Types of precipitants, Colloidal state, Colloidal Suspension Mechanism, Controlling Colloidal state, Precipitants	3

5.	Organic Precipitants, Advantages and disadvantages of Organic Precipitants, Inorganic Precipitants	1
6.	Evaluating Precipitation Gravimetry, Scale of operation, Accuracy, Sensitivity and specificity of gravimetric analysis	2
7.	Volatilization Gravimetry, principal of Volatilization Gravimetry, Thermogravimetry, Particulate gravimetry, Separation methods, Filtration, Extraction, direct method and indirect method	4
8.	Revision	2
9.	Selected Experiments related to course topics	22
Total		44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework	3-8	2%
2.	Quiz	4-6	3%
3.	Midterm Exam	6-8	15%
4.	Lab Sheet	11	7%
5.	Lab Report	3-8	10%
6.	Final Practical Exam	11	10%
7.	Safety Exam	9-10	3%
8.	Final Exam	12-14	50%
9.	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	Analytical chemistry, Christian, Gary D., Purnendu K. (Sandy), Kevin A. Schug, 7th edition (2014)
Supportive References	Quantitative Chemical Analysis & Solutions manual by Daniel C. Harris, 2006.
Electronic Materials	• https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods • https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods/8.2%3A_Precipitation_Gravimetry

	• https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods/8.3%3A_Volatilization_Gravimetry • https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods/8.4%3A_Particulate_Gravimetry
Other Learning Materials	Tutorial videos and pictures. Some course contents and materials are posted on Black board sites

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students 1 Lab room(s) for groups of 25 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	Laboratory glassware and equipment such as Erlenmeyer flasks watch glass, graduated cylinder, volumetric flask, graduated pipette, volumetric burette and beakers, water bath, magnetic stirrer, Electronic balance and hot plate

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 & indirect)
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

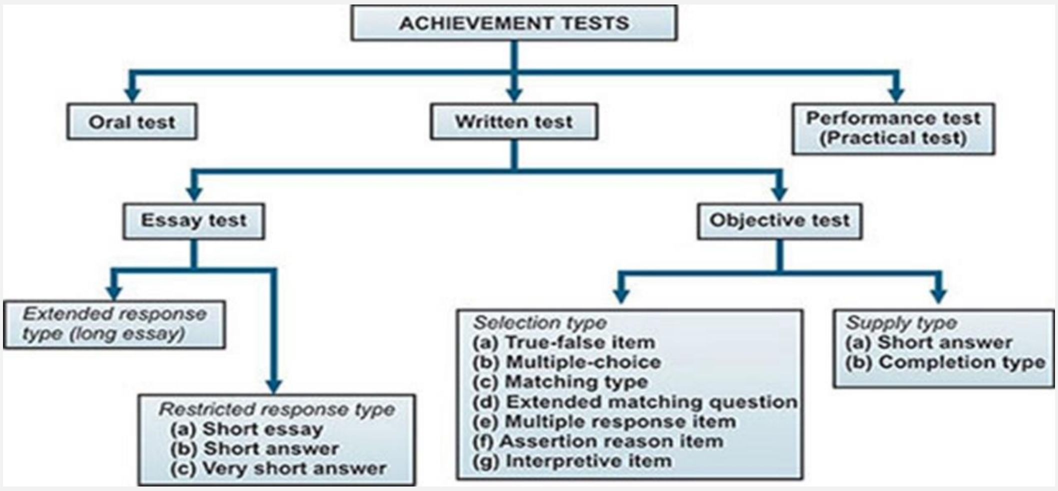
No	*Title of Experiment*	*Tools, Chemicals, and equipment Needed in Experiments*	# of Weeks
1	Laboratory safety, glassware and tools used in gravimetric analysis.	Drying oven, Muffle Furnaces, crucible burette , graduated cylinders, Volumetric flasks, pipettes and conical flasks, water bath,Hot plates ,Crucibles,Balances, Water distillation, water deionizer equipments and pH meters	1
2	Basic concepts, terminology and gravimetric calculations.	-	1
3	Determination of the number of water of crystallization in barium chloride dihydrate	Glassware, Oven, Crucibles, Barium chloride dihydrateand Analytical balance.	1
4	Gravimetric analysis of sulphate as $BaSO_4$	Glassware, Oven, filtration system, sodium sulphate,hydrochloric acid, barium chloride	1
5	Gravimetric determination of calcium as calcium Oxide.	Glassware,Furnace, filtration system, hydrochloric acid, calcium salt, ammonia solution, ammonium oxalate.	1
6	Gravimetric determination of nickel as nickel dimethylglyoxime	Glassware, Oven, filtration system, hydrochloric acid, nickel chloride, dimethylglyoxime and ammonia solution	1
7	Gravimetric determination of lead as lead chromate	Glassware, Oven, filtration system, hydrochloric acid, lead nitrate, potassium chromate, acetic acid,and sodium acetate	1
8	Gravimetric determination of iron as ferric oxide	Glassware, Furnace, filtration system, hydrochloric acid, ferrous sulphate, nitric acid, ammonium hydroxide and ammonium nitrate	1
9	Revision		1
10	FINAL EXAM		1

2- Blue Print

Course Name	Chemistry of Gravimetric Analysis
Course Code	212CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	30	24	16	27	3	--	-	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (30M)	Quiz	Objective test	2	1	1
			Mid term	Objective test	14	7	7
			Final Exam	Objective test	22	22	22
	K2	1.2 (24M)	Quiz	Essay Test	1	1	1
			Mid term	Essay Test	2	5	5
			Final Exam	Essay Test	3	18	18
Skills	S1	2.1 (16M)	H.W	Solving Problems	4	2	2
			Quiz	Solving Problems	1	1	1
			Mid term	Solving Problems & Essay question	2	3	3
			Final Exam	Solving Problems & Essay question	4	10	10
	S2	2.2 (27M)	Practical Sheet	Objective test	8	4	4
				Essay question	3	3	3
			Lab Report	Lab report rubrics	10	10	10
			Final Lab Exam	I Task experiment	1	10	10
	S3	2.3 (3M)	***Safety EXAM***	Objective test	6	3	3
	TOTAL	100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **Chemistry of main groups**	
Course Code: **221CHEM-4**	
Program: **Bachelor in Chemistry**	
Department: **Chemistry**	
College: **College of Science**	
Institution: **Jazan University (J U)**	
Version: **T104 2022**	
Last Revision Date: **29 December 2022**	

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	4h
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered:	Level 5 Year 2

1. Course Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Chemistry of main groups	*221CHEM-4*	*3*	*2*	*3*	*2*	*5*	*101CHEM4*

Course Objectives ; They are to identify the following

1- ***Recognizing the elements and their chemical and physical properties.***
2- ***Recognizing the periodic table of the elements.***
3- ***Recognizing the properties of elements by knowing the group that belongs to.***

Syllabus: A-Theoretical contents

4- ***Study effective nuclear charge - formal charge - draw molecular orbital diagram for the molecule - Study of the properties of the elements in the groups and periods of the periodic table – Chemistry of hydrogen – Elements of the first group (Alkali Metals) – Elements of the second group (Alkaline Earth Metals) - Elements of the third group – Elements of the fourth group – Elements of the fifth group – Elements of the sixth group – Elements of the seventh group (Halogens) – Elements of the eighth group (Noble Gases).***

Syllabus: A-Practical contents

Selected experiments in qualitative and quantitative analysis.

5. Pre-requirements for this course (if any):101CHEM-4

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

7. Course Main Objective(s)

The course of chemistry of main groups is designed to give the students basic information about the General properties of S and b-block elements in periodic table.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		100

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	55

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 a broad, knowledge in the properties of Hydrogen, periodic table groups (I, II, III,…etc) elements and their related properties, preparation and uses. (I)	K(1.1)	***lecture / discussion Seminars /presentation***	***Objective question***
1.2	Describe the types of hydrides, oxides and carbides. Describe the allotropy phenomena, and the difference in chemical and physical properties of the main groups. (I)	K(1.2)	***lecture / discussion / Seminars /Individual presentation***	Essay question
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills required to calculate effective nuclear charge, formal charge, and draw molecular orbital diagram for	S(2.1)	***lecture / discussion / Seminars***	Solving Problems & chart analysis

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	the molecule. (I)		*/Individual presentation*	
2.2	Carry out scientific experiments as well as accurately record and analyze the results of such experiments. (I)	S(2.2)	*Lab work, group work*	*Objective question, Essay question,* *lab report rubric*
2.3	Examine his material and lab safety background to Follow proper procedures and regulations for safe handling and use of chemicals. (I)	S(2.3)	*lab demonstrations / hands-on student learning activities*	*Safety exam*

C. Course Content

No	List of Topics	Contact Hours
1.	General properties of the elements in periodic table.	4
2.	Types of bonds	5
3.	VSEPR theory and molecular orbital theory	5
4.	Hydrogen, properties, position, isotopes, preparation and uses	2
5.	Group (I): alkali metals, properties, oxides, stability and Extraction.	3
6.	Group (II): Electronic configuration, occurrence, properties and extraction.	2
7.	Group (III), Electronic configuration, occurrence, properties, extraction,	2
8.	Group (IV), Electronic configuration, occurrence, properties, extraction hydrides, halides, oxygen compounds and carbides.	2
9	Group (V), Electronic configuration, occurrence, properties, extraction hydrides, uses, (N,P,….)and oxides.	2
10	Group (VI), Electronic configuration, occurrence, extraction (S, O….) uses of ozone, H_2O_2, Halides, Oxides, and uses of Sulphur.	2
11	Group (VII), Halogens, Electronic configuration, occurrence, uses of HF and Halogen oxides.	2
12	Noble gases, electronic structure, properties, occurrence and preparation	2
13	Selected Experiments related to course contents	22
	Total	55

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Homework assignment***	***3-8***	***1%***
2.	***Lecture Quizzes***	***5-7***	***4 %***
3.	***Mid-term exam***	***6-8***	***15 %***
4	***LAB Sheet***	***15***	***5 %***
5	***Safety Exam***	***11***	***3%***
6	***Final practical exam***	***11***	***12%***
7	***Lab report***	***2-10***	***10 %***
8	***Final Exam***	***12-14***	***50 %***
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	Inorganic Chemistry, 5th Edition by Gary L. Miessler, Paul J. Fischer, Donald A. Tarr, (2013)
Supportive References	Concise Inorganic Chemistry, 5th Edition, J.D. Lee, Blackwell Science Ltd (1996)
Electronic Materials	***Some course contents and materials are posted on Black board sites***
Other Learning Materials	• Molecular Orbital Diagram Maker (sydney.edu.au)https://courses.lumenlearning.com/chemistryformajors/chapter/introduction-to-electrochemistry/

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

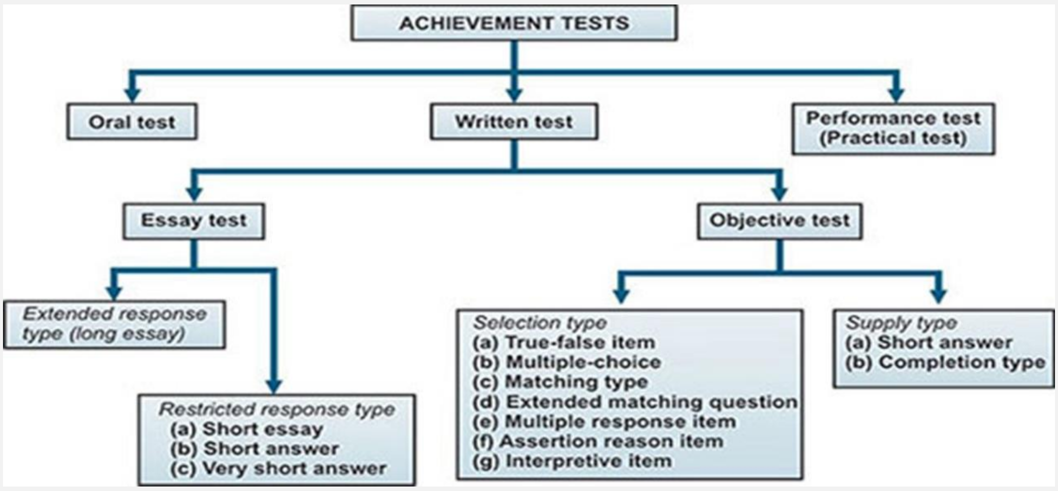
No.	Experiment Title	Required Chemicals	Required Glass Wear& equipment	week
1	Safety	------	----	1
2	Separation and determination of potassium	1- Potassium chloride salt. 2- Tartaric acid (17% solution).	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	2
3	Separation and determination of calcium	1- Calcium Chloride salt. 2- Sodium carbonate Na_2CO_3 (10% solution).	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	3
4	Separation and determination of aluminum	1. Aluminum Chloride salt. 2. Sodium sulpide Na_2S (23% solution).	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	4
5	Separation and determination of tin	1-Tin Chloride salt. 2- Sodium sulphide Na_2S (15% solution).	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	5
6	Separation and determination of lead	1- Lead acetate salt. 2- Potassium dichromate K_2CrO_4 (10% solution).	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	6
7	Separation and determination of bismuth	1- Bismuth nitrate salt. 2- Potassium iodide KI (45% solution).	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	7
8	Separation and determination of barium	1- Diluted sulphoric acid. 2- Barium chloride $BaCl_2$. 3- Hydrochloric acid HCl	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	8
9	Separation and determination of iodine	1- Sodium iodide salt. 2- Lead acetate $(CH_3COO)_2Pb$ (33% solution).	Conical flask , beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	9
10	determination of total hardness of tape water	1-EDTA 2-EBT 3- buffer solution	Conical flask , burette beakers , tubes , filter papers, holders, heater ,vacuum gas chamber	10
13	Final practical exam	----	---	11

2- Blue Print

Course Name	Chemistry of main groups
Course Code	221CHEM-4

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3			
Marks	29	25	16	27	3			

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (29M)	Quiz	Objective question	2	3	3
			Mid term	Objective question	1	5	5
			Final Exam	Objective question	2	21	21
	K2	1.2 (25M)	Quiz	Essay question	2	2	1
			Mid term	Essay question	1	5	6
			Final Exam	Essay question	2	18	18
Skills	S1	2.1 (16M)	H.W	Solving Problems & chart analysis	4	1	1
			Mid term	Solving Problems & chart analysis	2	4	4
			Final Exam	Solving Problems & chart analysis	6	11	11
	S2	2.2 (27M)	Practical Sheet	Objective question	5	5	5
			Lab Report	10 EXP.	10	10	10
			Final Lab Exam	Task	1	12	12
	S3	2.3 (3M)	***Safety EXAM***	Objective question	8	3	3
	TOTAL	100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Aliphatic Organic Chemistry**
Course Code:	**231CHEM-3**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**25 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 4* *Year 2*
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Aliphatic Organic	*231CHEM3*	*2*	*2*	*3*	*2*	*4*	*101CHEM4*

Course objectives: They are to identify the following.

- ***Identifying and analyzing the structure of organic compounds by recognizing main functional groups, naming the compounds using the I.U.P.A.C. system, and predicting their properties using the type of bonding, hybridization state, intermolecular forces, and stereochemistry.***
- ***Describing the reactions: nucleophilic substitution, elimination, and electrophilic addition, and apply this knowledge to predict the major product in organic reactions, such as those involving hydrocarbons,***
- ***analyzing the nature of a reagent: as a nucleophile, or electrophile and use this knowledge to propose the synthesis of organic compounds, such as a hydrocarbon, alkyl halides, alcohols, or alkenes.***
- ***demonstrate proficiency in organic laboratory skills as they pertain to: chemical information, safe handling, use, and disposal of organic compounds; identify different unknown organic compounds and use of instrumentation, and writing laboratory reports following current scientific journal styles.***

Syllabus: A-Theoretical contents

- ***Principles of organic chemistry and its importance – molecular structure and properties of organic compounds – functional groups in organic compounds –principle organic reactions – studying different classes of aliphatic organic compounds including; nomenclature, chemical structure, physical properties, methods of preparation, chemical reactions and common uses of: saturated and unsaturated aliphatic compounds***

Syllabus: A-Practical contents

Basic knowledge concerning general Safety Rules, Lab Equipment, Basic Laboratory Techniques, Measuring Volume and melting point, Purification of Organic Compounds, and sublimation. Finally, Identification of an unknown liquid and solid organic compounds.

5. Pre-requirements for this course (if any): ***101CHEM4***

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

7. Course Main Objective(s)

This course aims to give students the basic knowledge concerning saturated and unsaturated aliphatic organic compounds, their nomenclature, methods of preparation and their most important chemical reactions.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge and understanding in the hybridization, bonding in organic compounds, the nomenclature of organic compounds, organic reactions, isomerism of organic compounds, reactions, and preparations	K(1.1)	***lecture***	***Objective Q***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	of alkane, alkene, alkyne, and aromatics. (I)			
1.2	Describe the reactions: nucleophilic substitution, elimination, and electrophilic addition, and apply this knowledge to predict the major product in organic reactions, such as those involving hydrocarbons, alkyl halides, alkenes, alkynes, and aromatic. (I)	K(1.2)	***lecture***	***Objective Q*** ***Essay Q***
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	analyze the nature of a reagent: as a nucleophile or electrophile and use this knowledge to propose the synthesis of organic compounds, and draw their structure, and differentiate between them. (I)	S(2.1)	***lecture***	***Essay Q & Solve Problems***
2.2	perform experiments for the investigation and identification of unknown solid organic compounds, and write reports about It. (I)	S(2.2)	***Lab work***	***Lab report***
2.3	Examine and follow proper procedures and regulations for safe handling, use, and disposal of chemicals (I)	S(2.3)	***Lab work***	***Objective Q*** (Safety Quiz)

C. Course Content

No	List of Topics	Contact Hours
1.	***Introduction to Organic Chemistry***	***1***
2.	***Structure, chemical bonding in organic compounds, and formal charges***	***1***
3.	***SP3, SP2, SP hybridization of methane, ethane and ethyne.***	***1***
4.	***Functional groups***	***2***
5.	***Isomerism, types of structural isomerism and types of stereoisomerism.***	***2***
6.	***Organic reactions and Acid-Base reactions***	***3***
7.	***Nomenclature of Alkanes, Alkenes, and Alkynes and their cyclic forms.***	***3***
8.	***Alkenes and alkynes, preparation, reactions and their application***	***4***
9.	***Aromatic compounds, aromaticity, and Nomenclature***	***2***
10.	***Electrophilic aromatic substitution for benzene, monosubstituted, disubstituted, and poly-substituted aromatics***	***3***

11.	***Identification of an unknown liquid and solid organic compounds (LAB)***	22
	Total	44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Homework assignment***	***3-5*** and ***6-11***	***5 %***
2.	***Mid-term exam***	***6-8***	***15 %***
4.	***LAB Sheet***	***11***	***5 %***
5.	***Quiz in Safety***	***9***	***3%***
6.	***Final practical exam***	***11***	***12 %***
7.	***Lab report***	***2-10***	***10 %***
9.	***Final Exam***	12-14	***50 %***
	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	Organic Chemistry, 9e Written by Jr. Leroy G. Wade, Jan William Simek, et al
Supportive References	Organic Chemistry (tenth edition) Written by T. W. Graham Solomons and Craig B. Fryhle http://chemistry.com.pk/books
Electronic Materials	https://www.khanacademy.org/science/organic-chemistry https://www.organic-chemistry.org/ https://en.wikipedia.org/wiki/Organic_chemistry https://www.masterorganicchemistry.com/organic-1/
Other Learning Materials	https://www.youtube.com/watch?v=cAxJw_W05ZY https://www.chemguide.co.uk/orgmenu.html https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.htm

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	Glassware, chemicals, hotplates, water bathes, flam, electrical balance, UV lamb, and IR.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
The extent of achievement of course learning outcomes	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	Indirect
Exam Quality assessment		Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

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

H. Attachments

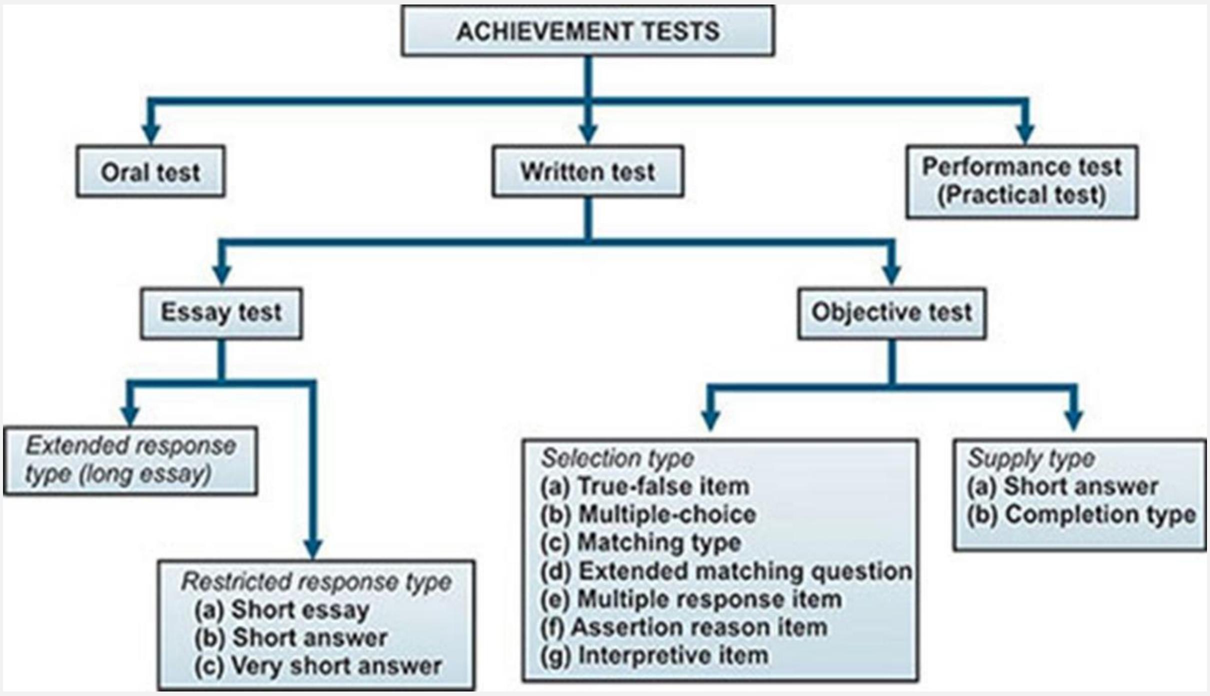
1- Practical Work

Week	EXPERMENTAL TITLE		Remarks
1	General Safety Rules, Lab Equipment, and Basic Laboratory techniques.		
2	Measuring volume and melting point		None
3	Purification of Organic Compounds and sublimation		None
4	Simple Liquid Organic Compounds, Identification of hydrocarbons and alcohols		None
5	Identification of Phenols, Aldehydes, and Ketones		None
6	Identification of Carboxylic acid and amines		None
7	Exam of Simple Liquid Organic Compounds		None
8	Simple Solid Organic Compounds and identifications of carbohydrates		None
9	Identification of Carboxylic acid, salts of carboxylic acids, and urea		None
10	Identification of Aniline salts		
11	Final Exam		

Blue Print

Course Name	Aliphatic Organic Chemistry							
Course Code	3-CHEM-231							
PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3			
Marks	30	25	15	27	3			

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	**K1**	**1.1 (30 M)**	Homework	Objective Question	**1-2**	**1**	**1%**
			Mid term	Objective Question	**1-2**	**7**	**7%**
			Final Exam	Objective Question	**1-2**	**22**	**22%**
	K2	**1.2 (25 M)**	Homework	Objective Question & short answer questions	**1-2**	**2**	**2%**
			Midterm	Objective Question & short answer questions	**1-3**	**5**	**5%**
			Final Exam	Objective Question & short answer questions	**1-3**	**18**	**18%**
Skills	**S1**	**2.1 (15 M)**	Homework	Short answer questions & solving Problems	**1-3**	**2**	**2%**
			Midterm	Short answer questions & solving Problems	**1-3**	**3**	**3%**
			Final Exam	Short answer questions & solving Problems	**1-3**	**10**	**10%**
	S2	**2.2 (27 M)**	Practical Sheet	Objective Question & short answer questions	7	**7**	**7%**
			Final Practical Exam	I Task experiment	---	**20**	**20%**
	S3	**2.3 (3 M)**	***Safety EXAM***	Objective Question	6	**3**	**3**
TOTAL		**100**				**100**	**100%**


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Aromatic Organic Chemistry**
Course Code:	**232 CHEM-3**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**28 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 2

4. Course general Description

1. Course Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lect.	Practical.				
Aromatic organic chemistry	*232CHEM 3*	*2*	*2*	*3*	*2*	*Six level*	*231CHEM 3*

Course objectives: They are to identify the following.

1- Identifying the properties of aromatic organic compounds
2- To provide students with the basic knowledge concerning nomenclature of aromatic organic compounds.
3 - To familiarize students with the methods of preparation of aromatic compounds and their different chemical reactions
4- To familiarize students with the importance of aromatic compounds and their applications

Syllabus: A-Theoretical contents

Nomenclature, Physical properties, reactivity, classification, preparation, reactions and their application for aliphatic and aromatic of; Halo Compounds, Alcohols and Ethers, Phenols, Aldehydes and Ketones, Carboxylic Acids, Carboxylic Acid derivatives, Aromatic Nitro-Compounds, Amines, Aromatic Diazonium Salts and Their Related Compounds, Aromatic Sulphonic Acids.

Syllabus: B-Practical contents

Selected experiments related to the course content;
Investigation of organic solid compounds
Identification methods of liquid organic compounds
*See attachment

5. Pre-requirements for this course (if any): 231 CHEM-3

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

7. Course Main Objective(s)

This course aims to provide students with the basic knowledge concerning aromatic organic compounds, their methods of preparation, properties and their most important chemical reactions

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
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)	
	Total	44

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 a broad understanding and view of the principal theories, concepts and terminology of organic chemistry area. (I)*	K (1.1)	*lecture / discussion Seminars /presentation*	*Objective question*
1.2	*Describe Chemical phenomena using organic chemical principles of organic chemistry and understanding the reaction mechanisms for performing of the organic reactions. (I)*	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 an ability in critical thinking for the nomenclature and draw the structure of all classes of organic*	S (2.1)	*lecture / discussion*	*Objective question*

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	compounds and differentiate between them. (I)		*Seminars /presentation*	
2.2	*Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments in various fields of chemistry and to write a report representing the scientific data. (I)*	S (2.2)	*Lab work, group work*	*Objective question, Essay question,* *lab report rubric*
2.3	*Examine his material and lab safety background to Follow proper procedures and regulations for safe handling and use of chemicals. (I)*	S (2.3)	*lab demonstrations / hands-on student learning activities*	*Safety exam*

C. Course Content

No	List of Topics	Contact Hours
1.	*Revision on aromaticity, electrophilic aromatic substitution reactions and orientation in aromatic system.*	2
2.	*Halo compounds (aliphatic and aromatic).*	3
3.	*Alcohols, Ether (aliphatic and aromatic).*	3
4.	*Phenols.*	2
5.	*Aldehydes and Ketones (aliphatic and aromatic).*	2
6.	*Carboxylic Acids (aliphatic and aromatic).*	2
7.	*Carboxylic Acid derivatives (aliphatic and aromatic).*	2
8.	*Aromatic Nitro-Compounds*	2
9.	*Amino Compounds, Diazonium Salts and Their Related Compounds*	2
10	*Aromatic Sulphonic Acids*	2
11	*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%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
4.	***LAB Sheet***	**11**	**7%**
5.	***Quiz in Safety***	**11**	**3%**
6.	***Final practical exam***	**11**	**10%**
7.	***Lab report***	**Through Semester**	**10%**
9.	***Final Exam***	**12-14**	**50%**
	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	*Organic Chemistry, 12th Edition T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder ISBN: 978-1-119-24370-0 November 2016Edition 2015.*
Supportive References	*Organic Chemistry, 12th Edition T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder ISBN: 978-1-119-24370-0 November 2016Edition 2015.*
Electronic Materials	1- *https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry).* 2- *https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Organic_Chemistry_with_a_Biological_Emphasis_v2.0_(Soderberg).* 3- ***https://chem.libretexts.org/Courses/Nassau_Community_College/Organic_Chemistry_I_and_II.***
Other Learning Materials	• None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	***1 Lecture room for groups of 50 students.*** ***1 Laboratory for group of 25 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	***Student***	***Likert-type Survey (CES) Indirect***
Effectiveness of student's 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		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

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

H. Attachments

1- Practical Work

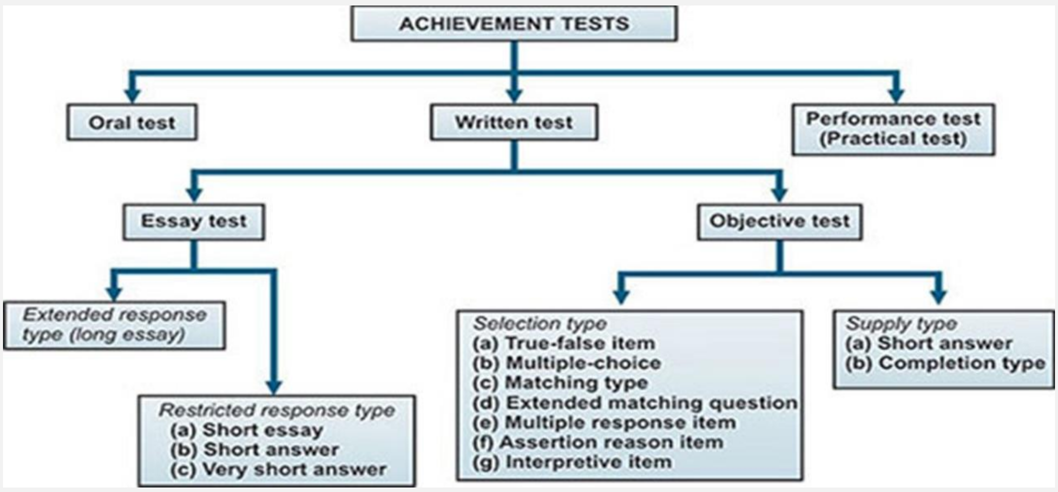
Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact Hrs.**
1. General Safety Rules	1	2
2. Lab. Equipment	1	2
3. Qualitative analysis of solid organic compounds	1	2
4. Ignition Test, Heating with soda-lime test, Treatment with 20% NaOH Test and Treatment with Conic H2SO4 Test.	1	2
5. Nitration Test, Acidity test, Solubility and reverse precipitation Test, FeCl3 Test	1	2
6. Combination of compounds containing (C, H, O). Identification of Carbohydrates, Carboxylic acids, Phenols, Aldehydes-Ketones, Metallic salts and Hydrocarbon.	1	2
7. Combination of compounds containing (C, H, O, N). Identification of Ammonium salts of acids, Amide, Imides and Amines.	1	2
8. Combination of compounds containing (C, H, O, N, S).	1	2
9. Combination of compounds containing (C, H, O, N and halogens).	1	2
10. Revision	2	2
11. Final practical exam.	1	2

2- Blue Print

Course Name	Aromatic Organic Chemistry
Course Code	232 CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	--	--	--
Marks	30	24	16	27	3	--	--	--

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	**K1**	**1.1 (30 M)**	***Homework***	Objective question	2	**2**	**2%**
			Midterm	Objective question	2	**7**	**7%**
			Final Exam	Objective question	2	**21**	**21%**
	K2	**1.2 (24 M)**	***Homework***	Objective question	2	**2**	**2%**
			Midterm	Objective question	2	**5**	**5%**
			Final Exam	Objective question	2	**17**	**17%**
Skills	**S1**	**2.1 (16 M)**	***Homework***	Objective question	2	**1**	**1%**
			Midterm	Objective question	2	**3**	**3%**
			Final Exam	Objective question	3	**12**	**12%**
	S2	**2.2 (27 M)**	***Practical Sheet***	Objective question	3	**7**	**7%**
			Final Practical Exam	I Task experiment	----	**20**	**20%**
	S3	**2.3 (3 M)**	***Safety EXAM***	Objective question	6	**3**	**3%**
TOTAL		**100**				**100**	**100%**



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Thermodynamics**
Course Code:	**241CHEM3**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**25 December 2022**

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Content	Page

A. General information about the course:

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 7 Year 3
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lecture	*Practical*				
Thermodynamics	*241 CHEM*	*2*	*1*	*3*	*3*	*7*	*201CHEM-4*

The course is designed to give the students basic information about the thermodynamic chemistry, laws, thermochemistry, and phase rule

Course objectives: They are to identify the following.

- ***1. Identify the types of thermodynamic systems and processes***
- ***2. Recognize the different thermodynamic laws and thermochemistry***
- ***3. Calculate the required thermodynamic parameters via solving problems***
- ***4. Identify the applications of thermodynamic phenomena***
- ***5. Understand the phase rule and related phase transitions***
- ***6. Investigate one, two and three component system and calculate degree of freedom.***

Syllabus: A-Theoretical contents

Heat and work, Heat capacity, specific heat, thermodynamic process, thermodynamic laws: thermochemistry, Carnot cycle, Joule-Tomson effect Gibbs- Helmholtz free energy, phase rule, system with different component.

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content.

5. Pre-requirements for this course (if any): ***344CHEM***

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

7. Course Main Objective(s)

The course is designed to give the students basic information about the thermodynamic chemistry, laws, thermochemistry, and phase rule

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad understanding and critical view on the principle of thermodynamic chemistry, Concepts, and terminology of thermodynamic topics, including Heat, Work, different types of systems, and laws of thermodynamic	K(1.1)	***lecture / discussion Seminars /presentation***	***Objective question***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	Describe correctly the different phenomena associated with thermodynamic laws, phase rule, and phase transitions	K(1.2)	***lecture / discussion / Seminars /Individual presentation***	Essay question
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	Demonstrate critical thinking, numeracy, statistical, analytical reasoning, use graphs, charts and solve problems related to work, Enthalpy, internal energy, Entropy, Gibbs free energy, Helmholtz free energy, degree of freedom, and systems with different components.	S(2.1)	***lecture / discussion / Seminars /Individual presentation***	Solving Problems & chart analysis
2.2	Perform experiments in Thermodynamic chemistry, record, analyze, interpret the scientific data, and write reports. (M)	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 correct techniques and rules for secure handling when using chemicals. (P)	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 in cooperation with other colleagues. (P)	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.	*Basics of thermodynamic chemistry*	3
2.	*The 0th. Law of thermodynamics and Gases*	2
3.	*Work and Heat, Internal Energy and the 1st. Law of Thermodynamics*	3
4.	*Entropy, the 2nd. Law of Thermodynamics and More on Entropy*	3
5.	*The 3rd. Law of Thermodynamics*	2
6.	*Thermochemistry*	3
7.	*Solutions and Condensed Phases Equilibrium and Chemical Equilibrium, Changes in Equilibrium Constants*	2
8.	*A Single -Component System and Phase Transition*	2
9.	*The Gibbs Phase Rule and Two Components: Liquid/Liquid Systems*	2
10.	Selected topics related to course content	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***	***1%***
2.	***Lecture Quizzes***	***4-6***	***4%***
3.	***Mid-term exam***	***6-8***	***15 %***
4.	***LAB Sheet***	***11***	***5 %***
5.	***Quiz in Safety***	***10-11***	***3%***
6.	***Final practical exam***	***11***	***10 %***
7.	***Lab report***	***2-10***	***10 %***
8.	***Group work evaluation***	***2-10***	***2%***
9.	***Final Exam***	***12-14***	***50 %***
	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	Physical Chemistry (Second Edition) **by** David W. Ball, Cleveland State University, 2014**.**
Supportive References	Essentials Of Physical Chemistry. Bahl A., et al. S. Chand. 2010, English. 4ed. 1166\1166. 1122910 Translated Arabic version of peter Atkins (KSU)

Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	***www.wikipedia.org/*** https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=thermodynamic&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching		Likert-type Survey CES) Indirect
Effectiveness of students' assessment		Classroom evaluation (direct & indirect
Quality of learning resources		Indirect
The extent to which CLOs have been achieved		Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

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

H. Attachments

1- Practical Work

<table>
<tr><th>Week</th><th>EXPERMENTAL TITLE</th><th>Chemicals and Apparatus used</th><th>Remarks</th></tr>
<tr><td>1</td><td>Safety and regulations</td><td></td><td></td></tr>
<tr><td>2</td><td>The Heat Capacity of the Calorimeter.</td><td rowspan="2">☐Styrofoam cups
☐ Ice
☐ 100 mL graduated cylinder
☐ Cardboard lid w/ hole
☐ DI water
☐ Burner or hot plate
☐ Thermometer (-10 to 110 °C)
☐ 150 mL Beaker
☐ Watch or Clock
☐ Thermometer clamp
☐ 250 mL Beaker
☐ Centigram balance</td><td>None</td></tr>
<tr><td>3-4</td><td>Heat of Fusion of ICE.</td><td>None</td></tr>
<tr><td>3-4</td><td>Specific Heat Capacity of an Unknown Metal.</td><td>☐Styrofoam cups
☐ Ice
☐ 100 mL graduated cylinder
☐ Cardboard lid w/ hole
☐ DI water
☐ Burner or hot plate
☐ Thermometer (-10 to 110 °C)
☐ 150 mL Beaker
☐ Watch or Clock
☐ Thermometer clamp
☐ 250 mL Beaker
☐ Centigram balance
☐metal sample (i.e.: Iron, Copper, Zinc, Aluminum...)</td><td>None</td></tr>
<tr><td>5-6</td><td>Heat of Solution of a Salt. (exo- and endo-) thermic dissolution.</td><td>☐ Styrofoam cup
☐ Balance
☐ Thermometer
☐ 100 mL graduated cylinder
☐ Anhydrous Sodium acetate,
☐ Ammonium nitrate, NH4NO3</td><td>None</td></tr>
<tr><td>5-6</td><td>Heat of Neutralization.</td><td>☐Styrofoam cups
☐ Ice
☐ 100 mL graduated cylinder
☐ Cardboard lid w/ hole
☐ DI water
☐ Burner or hot plate
☐ Thermometer (-10 to 110 °C)
☐ 150 mL Beaker</td><td>None</td></tr>
</table>

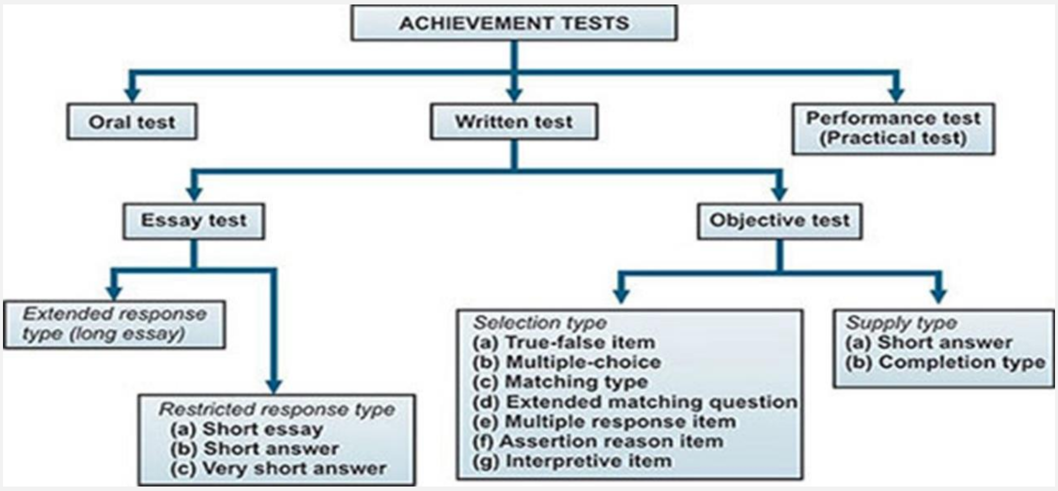
		□ Watch or Clock □ Thermometer clamp □ 250 mL Beaker □ centigram balance □ NaOH, HCl and CH3COOH	
7	*Heat of Precipitation.*	□ Foam cup □ Thermometer □ Silver nitrate solution □ Sodium chloride solution	***None***
7-8	*Heats of Reaction – Hess's Law.*	□ Styrofoam cup □ Balance □ Thermometer □ 100 mL graduated cylinder □ sodium hydroxide, NaOH □ 1M sodium hydroxide □ 1M Hydrochloric acid □ 0.5M Hydrochloric acid □ Distilled water	***None***
8	*The Thermodynamics of Solubility.*	□Solid KNO_3 □ Boiling water bath □ Graduated cylinders □ one 50 mL graduated cylinder with the plastic base removed □ one 25 mL graduated cylinder □ one 10 mL graduated cylinder □ Thermometer or temperature measuring probe □ Large test tube	***None***
8-9	*Spontaneity of Reaction.*	□ Solid KNO_3 □ Foam cup □ Graduated cylinders □ Thermometer or temperature □ measuring probe	***Metal sheets and equipment are not available***
8-9	*Determination of Critical Solution Temperature (CST)*	□Test tubes, □ boiling tube as air jacket, □ thermometer (graduated to 0.1°C), □ stirrer, □ beakers, □ phenol, water □ sodium chloride 1N, □ Hot plate.	***Metal sheets and equipment are not available***
10	*Phase diagram of 3 Component systems*	□ Test tubes, □ thermometer (graduated to 0.1°C), □ stirrer, □ beakers, □ Ethanol / Toluene / Water	***Metal sheets and equipment are not available***
11	***Final exam***		

2- Blue Print

Course Name	Thermodynamics
Course Code	241 CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs								3.2
Marks	30	24	16	25	3		2	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (30 M)	Quiz	Objective question	3	3	2
			Mid term	Objective question	1	5	6
			Final Exam	Objective question	2	22	22
	K2	1.2 (24 M)	Quiz	***Essay question***	2	2	2
			Mid term	***Essay question***	1	5	5
			Final Exam	***Essay question***	2	17	17
Skills	S1	2.1 (16M)	H.W	Solving Problems & chart analysis	4	1	1
			Mid term	Solving Problems & chart analysis	2	4	4
			Final Exam	Solving Problems & chart analysis	6	11	11
	S2	2.2 (25 M)	Practical Sheet	MCQ	6	5	5
			Lab Report	Lab Report Rubric	10	10	10
			Final Lab Exam	I Task experiment	1	12	10
	S3	2.3 (3 M)	Safety Quiz	MCQ	8	3	3
Values	V1	3.1(2M)	Groupwork evaluation	rubric			2
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **Chromatographic Analysis**	
Course Code: **313CHEM-3**	
Program: **Bachelor in Chemistry**	
Department: **Bachelor in Chemistry**	
College: **College of Science**	
Institution: **Jazan University (JU)**	
Version: **T104 2022**	
Last Revision Date: **08 January 2023**	

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	3 Credit Hours
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered:	Level 11 Year 4

4. Course general Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Chromatographic Analysis	*313 CHEM 3*	*2*	*2*	*3*	*4th*	*11th*	*212CHEM3*

Course Objectives; They are to identify the following:

[1] Develop basic understanding of chromatography principles and theories.
[2] Describe the setup and instrumentation of the main chromatographic techniques.
[3] Recognize the advantages and limitations of the main chromatographic techniques.
[4] Calculate chromatographic factors and constants.
[5] Interpret chromatographic data and results.
[6] Develop basic experimental skills of chromatographic analysis.

Syllabus: A-Theoretical content

Definitions of chromatographic analysis terms and parameters, classifications of chromatographic techniques, advantages and disadvantages of the different techniques, main theories of chromatography, calculating and interpreting chromatographic factors and parameters, setup and instrumentation of main chromatographic techniques (PC, TLC, GC and HPLC), applications of chromatographic analysis.

Syllabus: B-Practical content

Practical experiments using different chromatographic separation techniques.

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

212CHEM3

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

none

7. Course Main Objective(s)

This course aims to give the student an introduction to the principles and theories of chromatography as a tool of separation for quantitative and qualitative analyses. The course

will also cover the setup and instrumentation of the main chromatographic techniques and their applications.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad understanding and critical view of the principal theories, concepts and terminology of chromatographic analysis and its applications (M)***	***K(1.1)***	***lecture / discussion /Seminars /presentation***	***oral and written examinations/ laboratory reports***
1.2	***Describe the main techniques and instrumentations used in chromatographic analysis and their advantages and limitations and applications (M)***	***K(1.2)***	***lecture / discussion /Seminars /Individual presentation***	***oral and written examinations/ laboratory reports***
2.0	Skills ; (Upon completion of the course, student will be able to)			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	*Demonstrate an ability in critical thinking, numeracy, statistical, analytical reasoning, use of graphs and charts to solve problems in chromatographic analysis. (M)*	*S(2.1)*	*lecture / discussion /Seminars /Individual presentation*	*oral and written examinations/ laboratory reports*
2.2	*Perform experiments using various chromatographic techniques; record, analyze and interpret the chromatographic data, and write reports (M)*	S(2.2)	*Lab work, group work*	*Lab report/ Lab notebook.*
2.3	*Apply the proper procedures and regulations for safe handling, use and disposal of chemicals. (M)*	S(2.3)	*Lab demonstrations / hands-on student learning activities*	*Observation of practical skills / Safety exam / Practical assignments and laboratory reports*
3.0	Values, autonomy, and responsibility; (Upon completion of the course, student will be able to)			
3.1	*Working as a group leader in cooperation with other colleagues. (M)*	V(3.1)	*lab demonstrations / whole group and small group discussions*	*group project reports / Practical assignments and laboratory reports*

C. Course Content

No	List of Topics	Contact Hours
1.	*Course introduction and organization*	*1*
2.	*Introduction to separation*	*1*
3.	*Introduction to chromatography*	*2*
4.	*Basic chromatographic theories, terms and equations*	*5*
5.	*Paper chromatography (PC)*	*1*
6.	*Thin-layer chromatography (TLC)*	*1*
7.	*High Performance Liquid chromatography (HPLC)*	*4*
8.	*Gas chromatography (GC)*	*4*
9	*Analysis of real samples*	*1*
10	*Other separation techniques*	*1*
11	*Exam, quizzes and discussions*	*1*

12	***Practical experiments on different chromatographic separation techniques.***	***22***
Total		44

D. Students Assessment Activities

No	Assessment Activities *		Assessment timing (in week no)	Percentage of Total Assessment Score
1	**Homework assignment**		**2-9**	**1.25**
2	**Lecture Quiz**		**2-9**	**1.25**
3	**Homework assignment**		**2-9**	**1.25**
4	**Lecture Quiz**		**2-9**	**1.25**
5	**Mid-term exam**		**4-9**	**15**
6	***LAB***	**Practical Sheet**	***11***	**5**
7		**Lab Report**	**2,3,4,5,7,9**	**9**
8		**Final Lab Exam**	**11**	**10**
9		**Safety Exam**	**10**	**3**
10		**Group evaluation rubric**	**2-9**	**3**
11	***Final Exam***		***12-13***	***50 %***
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	1- العثمان، زيد بن عبدالله و محمود، كريم يوسف حسن. الكروماتوجرافيا: الأسس، تحضير العينات، والطرق المرتبطة. دار جامعة الملك سعود للنشر، الطبعة الأولى، 2021. 2-Skoog, Douglas, Donald West, F. L. Holler, and Stanley Crouch. *Fundamentals of analytical chemistry*. Cengage Learning, 9th Edition 2014.
Supportive References	• سلامة، أحمد خميس محمد. التحليل الكروماتوجرافي (اساسيات وطرق التحليل). جامعة المجمعة، الطبعة الأولى، 2015. • العسود، بسام إبراهيم. التحليل الآلي. دار الفكر، الطبعة الأولى، 2011. • Ahuja, Satinder. *Chromatography and separation science*. Vol. 4. Academic Press, 2003. • Miller, James M. *Chromatography: concepts and contrasts*. John Wiley & Sons, 2nd Edition, 2005. • Braithwaite, Alan, and J. F. Smith. Chromatographic methods. Springer, 5th Edition, Reprint 1999.
Electronic Materials	• http://www.chromacademy.com/ • www.chromforum.org/ • http://www.lcresources.com/ • http://www.sepscience.com

	• http://chemwiki.ucdavis.edu/Analytical_Chemistry/Instrumental_Analysis/Chromatography/ • https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=chromatography&type=wiki
Other Learning Materials	***None***

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	*- Lecture Hall for 30 students equipped with modern teaching technology (projector, smart board, computer and internet)* *- Laboratory in accordance with the rules of safety and personal protection accessories should be available to all students*
Technology equipment (Projector, smart board, software)	*- Laptop computer, smart board and internet access in the classroom and laboratory*
Other equipment (Depending on the nature of the specialty)	*- Chemicals and standards used in lab experiments* *- Related analytical equipment and instruments such as GC, HPLC, UV lamp for TLC, separation columns and accessories, pH meter, analytical balance, …etc*

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Teaching and Assessment	Student	Likert-type Survey (CES) Indirect
Extent of achievement of course learning outcomes	Instructor & Course coordinator	Classroom evaluation (direct & indirect)
Quality of learning resources	Program coordinator	Indirect
Exam Quality assessment	Assessment committee	Indirect
Effectiveness of Teaching and Assessment	Student	Likert-type Survey (CES) Indirect

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

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

H. Attachments

1- Practical Work

Experiment	Chemicals, Glassware and Equipment	Remarks
Lab. Experiments' organization and manual design	Data Show.	
Safety demonstration	Safety Equipment in the lab.	
Separating food colors using paper chromatography	Goggles; gloves and fume hoods. Chromatography paper; Capillary tube to spot samples; Beaker tall-form 500-mL; Watch glass large (to fit beaker); Scissors; Pencil; Ruler. Commercial food colors; Sodium chloride solution, NaCl, 0.1%.	
Separating Amino Acids by Thin Layer Chromatography	Goggles; gloves and fume hoods. Thin Layer Chromatography Sheet: (20 x 20 cm) covered with 0.20 mm layer of silica gel 60 (MACHEREY-NAGEL ALUGRAM® Xtra SIL G or similar); Capillary tube to spot samples; Beaker, 1000-mL (Developing Chamber); Watch glass, large (to fit beaker); Spraying bottle for the detecting reagent; Scissors to cut the TLC sheet; Pencil; Ruler. Amino Acids STANDARD solutions of: Lysine, β-Alanine, Tryptophan. Developing solvent (Mobile Phase): a mixture of Acetonitrile : water (70:30 vol/vol). Detecting reagent: Ninhydrin solution - 0.3% (w/vol) Ninhydrin in n-butyl alcohol containing 3% glacial acetic acid. Drying oven or hair dryer for hot air.	
Separation and Identification of Pain-Killing Drugs by Thin Layer Chromatography	Goggles; gloves; face masks and fume hoods. Thin Layer Chromatography Sheet: (20 x 20 cm) covered with 0.20 mm layer of silica gel 60 (MACHEREY-NAGEL ALUGRAM® Xtra SIL G or similar); Capillary tube to spot samples; Beaker, 1000-mL (Developing Chamber); Watch glass, large (to fit beaker); Scissors to cut the TLC sheet; Pencil; Ruler. STANDARD solutions for Active ingredients: Caffeine (6.5 mg/mL); Paracetamol (50 mg/mL); Acetylsalicylic acid (30 mg/mL); Painkiller tablets; Developing solvent (Mobile Phase): a mixture of Ethyl acetate / Hexane / Acetic acid (60:39:1). UV light box with lamp at short wavelength.	
Separation of dyes by Column Chromatography	Goggles; gloves; face masks and fume hoods. Chromatography column (400 x 22 mm); Beakers (2), 100-mL; Plastic droppers or Pasteur pipettes; Measuring cylinder, 50-mL; Funnel with wide stem; Pencil (for tapping); Long glass rod to position the cotton wool plug.	

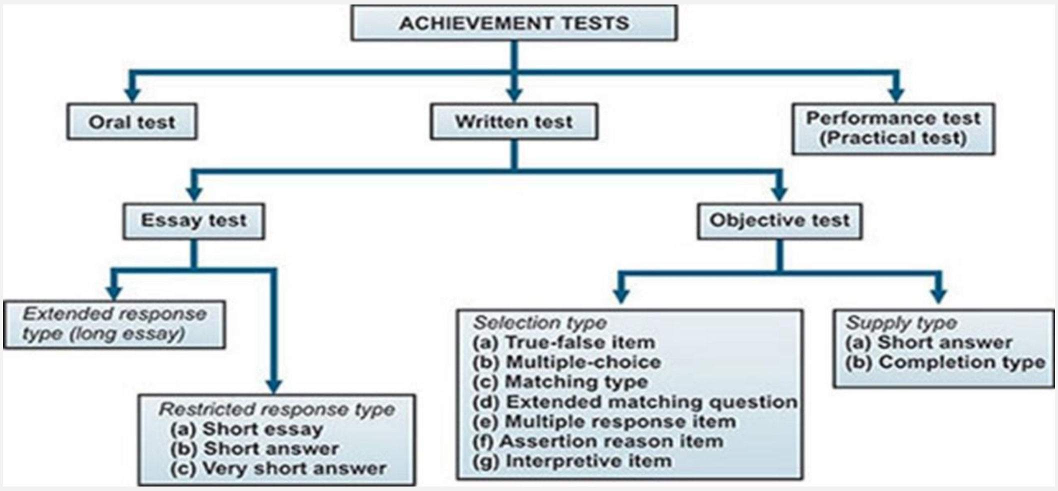
	Dyes Mixture: Mixture of Methyl Orange and Methylene Blue solutions (1:1). Single-compound solutions are prepared in 95% ethanol; Mobile Phase (Elution solvents): FIRST elution solvent: 95% (v/v) Ethanol/Water. SECOND elution solvent: Acetonitrile-Water-Acetic Acid (80:15:5 v/v).	
Determination of Caffeine and Benzoic Acid in Soft Drinks by HPLC with UV detector	Goggles; gloves; and fume hoods. HPLC with UV Detector; Ultrasonic bath. Volumetric flasks (2x10 mL); Reagent bottles (1x60 mL); Glass pipette (1x1 mL); Beakers (1x50 mL, 2x25 mL); Syringe Filter (0.2 µm); Plastic syringe (1x2 mL); HPLC glass vial (1x1.5mL). Soft drink sample; Phosphate buffer solution at pH=3 (50 mL); HPLC mobile phase components (Methanol and Phosphate buffer).	
Qualitative Separation of Alcohols by Gas Chromatography	Goggles; gloves; and fume hoods. GC with Thermal Conductivity Detector (TCD). Small Vials for the solvents; 10 uL micro syringe. Single-Standard of Alcohols (Methanol, Ethanol, 2-Propanol and 1-Butanol); Mixture of all the four alcohols to examine the separation conditions; Unknown mixture of the above alcohols.	
Field trip to a chromatography lab	A bus accommodating the total number of students in addition to 3 instructors.	
Experiments review and discussions.	Data show and glassware for demonstration.	
Practical and sheet exams	Depends on the experiments assigned for the exam.	Week 11

2- Blue Print

Course Name	Chromatographic Analysis
Course Code	313 CHEM-3

PLOs	K1	K2	S1	S2	S3	V1
CLOs	1.1	1.2	2.1	2.2	2.3	3.1
Marks	**18**	**22**	**30**	**24**	**3**	**3**

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (18M)	H.W.	Essay Q	5	1	1.25
			Mid term	Objective Q	8	4	4
			Final Exam	Objective Q	1	13	13
	K2	1.2 (22M)	Quiz	Essay Q	5	1	1.25
			Mid term	Essay Q	5	5	5
			Final Exam	Essay Q	4	16	16
Skills	S1	2.1 (30M)	H.W	Solving Problems & chart analysis	1	1	1.25
			Quiz	Solving Problems & chart analysis	5	2	1.25
			Mid term	Solving Problems & chart analysis	3	6	6
			Final Exam	Solving Problems & chart analysis	3	21	21
	S2	2.2 (24M)	Practical Sheet	Objective Q	10	5	5
			Lab Report	Lab Report Rubric	6	9	9
			Final Lab Exam	Lab Exam	1	10	10
	S3	2.3 (3M)	***Safety EXAM***	Objective Q	6	3	3
Value	V1	3.1 (3M)	Group work	Group evaluation rubric	-	3	3
					TOTAL		100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: Electrochemical Analysis Methods	
Course Code: **314 CHEM-3**	
Program: **Bachelor in Chemistry**	
Department: **Chemistry**	
College: **College of Science**	
Institution: **Jazan University (JU)**	
Version: **T104 2022**	
Last Revision Date: **5 January 2023**	

Table of Contents:

Content	Page

A. General information about the course:

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 9 Year 3

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Electrochemical Analysis Methods	*314CHEM-3*	*2*	*2*	*3*	*3*	*9th*	*344CHEM-3*

Course objectives: They are to identify the following: -

- Basic principles of analytical electrochemistry and electro-analytical methods
- Using some electro-analytical techniques in chemical analysis
- Experimental applications of some electro-analytical methods.

Syllabus: A-Theoretical contents.

Basic principles, concepts, instrumentation and applications of some electro-analytical methods such as potentiometry including ion selective electrodes, electrogravimetry, coulometry, conductometry, voltammetry including polarography and amperometric titrations.

Syllabus: B-Practical contents.

Selected experiments related to electro-analytical methods.

5. Pre-requirements for this course (if any): 344CHEM-3

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

7. Course Main Objective(s)

The course is designed to study the basic principles and experimental applications of some electro-analytical methods and their usage in chemical analysis.

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

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

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

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

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 broad understanding and critical view of the principles, classification and application of electro-analytical methods. (P)	K(1.1)	lecture / discussion	Objective Q & Essay Q
1.2	Describe correctly the essential facts, principles dealing withelectro-analytical methods. (P)	K(1.2)	lecture / discussion	Objective Q & Essay Q
2.0	Skills ; (Upon completion of the course, student will be able to)			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Demonstrate ability in critical thinking, numeracy, analytical reasoning, use graphs, charts for solving problems related to electro-analytical methods. (P)	S(2.1)	lecture / discussion	Solving Problems & chart analysis Objective Q & Essay Q
2.2	Applytheir experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments in various fields of electro-analytical methods and to write a report representing the scientific data.(P)	S(2.2)	Lab Work/ group Work	Objective Q & Essay Q, lab report rubric
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (P)	S(2.3)	lab demonstrations / hands-on student learning activities	Safety exam & Objective Q &
2.4				
3.0	Values, autonomy, and responsibility ; (Upon completion of the course, student will be able to)			
3.1	Working as group leaderin cooperation with other colleagues. (P)	V(3.1)	Lab demonstrations / whole group and smallgroup discussion	Practical group work Rubric
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	Basic principles and terminology of electrochemical cells	3
2.	Ion selective electrodes, principles, fabrication, and uses	4
3.	potentiometry and potentiometric titration	3
4.	Electrogravimetry and coulometry	3
5.	Conductometry and conductometric titration	3
6.	Voltammetry, polarography	3
7.	Amperometric titration	2
8.	Revision	1
9.	Selected Experiments related to course topics	22
Total		44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework	3-8	2%
2.	Quiz	4-6	3%
3.	Midterm Exam	6-9	15%
4.	Lab Sheet	11	5%
5.	Lab Report	Through semester	10%
6.	Final Practical Exam	11	7%
7.	Quiz in Safety	9-11	4%
8.	Group Work Evaluation	2-10	50%
9.	Final Exam	12-14	50%
10.	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	Undergraduate Instrumental Analysis, James W. Robinson, Eileen M. Skelly Frame and George M. Frame II, Taylor & Francis Group publisher, 7th edition (2014)
Supportive References	Analytical Electrochemistry , by Joseph Wang, John Wiley & Sons. Publisher, 2 nd edition (2006)

Electronic Materials	• https://chem.libretexts.org/Courses/British_Columbia_Institute_of_Technology/Chem_2305/03%3A_Electrochemistry/3.01%3A_An_Introduction_to_Electroanalytical_Chemistry • https://chem.libretexts.org/Under_Construction/Purgatory/Principles_of_Instrumental_Analysis_(Skoog_et_al.)_-_Under_Construction/23%3A_Potentiometry • https://chem.libretexts.org/Under_Construction/Purgatory/Principles_of_Instrumental_Analysis_(Skoog_et_al.)_-_Under_Construction/25%3A_Voltammetry • https://chem.libretexts.org/Under_Construction/Purgatory/Principles_of_Instrumental_Analysis_(Skoog_et_al.)_-_Under_Construction/25%3A_Voltammetry • https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Analytical_Sciences_Digital_Library/In_Class_Activities/Electrochemical_Methods_of_Analysis/02_Text/7%3A_Electrochemical_Analytical_Methods/7.4%3A_Titrimetic_Methods_of_Analysis
Other Learning Materials	Tutorial videos and pictures. Some course contents and materials are posted on Black board sites

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students 1 Lab room(s) for groups of 25 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	Laboratory equipment such as pH-Meter, Conductometer, Ion selective electrodes, polarography apparatus. In addition to glassware, water bath, magnetic stirrer, Electronic balance and hot plate

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey (CES) Indirect
Effectiveness of student's assessment	Instructor & Course coordinator	Class room evaluation (direct & indirect)
Quality of learning resources	Program coordinator	Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

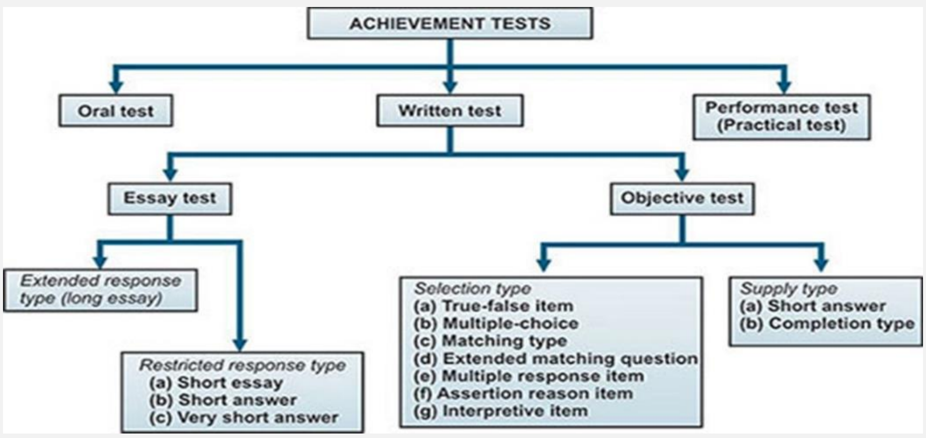
No.	Experiment Title	Required Chemicals	Required Glass Wear & equipment	Week
1	Safety and regulations	-	-	**1**
2	Potentimetric titration of a strong acid using a strong base	HCl, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	**2**
3	Potentimetric titration of a strong acid using a strong base (1st and 2nd derivatization)	-	-	**3**
4	Potentimetric titration of a strong base using a strong acid	HCl, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	**4**
5	Potentimetric titration of a strong base using a strong acid base (1st and 2nd derivatization)	-	-	**5**
6	Potentimetric titration of a weak acid using a strong base	Acetic acid, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	**6**
7	Potentimetric titration of a weak acid using a strong base(1st and 2nd derivatization)	-	-	**7**
8	Potentimetric titration of a strong base using a weak acid	Acetic acid, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	**8**
9	Potentimetric titration of a strong base using a weak acid (1st and 2nd derivatization)	HCl, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	**9**
10	Conductometric titration of a mixture of strong acid and weak acid using a strong base	HCl, Acetic acid, NaOH and distilled water	Glass burette, beaker 100 mL and pH-meter	**10**
11	**Final Lab. Exam**	-	-	**11**

2- Blue Print

Course Name	Electrochemical Analysis Methods
Course Code	314CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
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 (15M)	Quiz	Objective Q & Essay Q	1	2	1
			Mid term	Objective Q & Essay Q	2	3	3
			Final Exam	Objective Q & Essay Q	2	11	11
	K2	1.2 (21M)	Quiz	Essay Q	2	2	1
			Mid term	Essay Q	2	5	5
			Final Exam	Essay Q	3	15	15
Skills	S1	2.1 (34M)	H.W	Solving Problems & chart analysis & Essay Q	8	8	2
			Quiz	Solving Problems & chart analysis & Essay Q	2	2	1
			Mid term	Solving Problems & chart analysis & Essay Q	5	5	7
			Final Exam	Solving Problems & chart analysis & Essay Q	5	24	24
	S2	2.2 (22M)	Practical Sheet	Objective Q	6	3	3
				Essay Q	2	2	2
			Lab Report	Lab Report Rubric	10	10	10
			Final Lab Exam	I Task experiment	1	7	7
	S3	2.3 (4M)	Safety Quiz	Objective Q	8	4	4
Value	V1	3.1 (4M)	Continuous assessment	Group evaluation rubric	-	4	4
	TOTAL	100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Chemistry of Transition Elements**
Course Code:	**CHEM 322-4**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**30 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 7* *Year 3*

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Chemistry of	*CHEM 322-4*	*3*	*2*	*4*	*3rd*	*7th*	*CHEM 221-4*

This course aims to study the transition elements (d-block elements) and recognize their chemical and physical properties, and their various uses.

Course objectives: They are to identify the following.

- ***Recognizing the transition elements.***
- ***Recognizing the properties of these elements.***
- ***Recognizing the bond theories of the complexes.***
- ***Using the molecular orbital theory.***

Syllabus: A-Theoretical contents

a) The scientific content of the theoretical part:
- ***Definition of the transition elements - their location in the periodic table and their electronic structure - the general properties of their compounds – the double salts and coordination compounds – Werner's work - the effective atomic number rule - the valence bond theory - the crystal field theory– Tetragonal distortion of octahedral complexes (Jahn- Teller distortion) – Square planar complexes - Tetrahedral complexes- The properties, extraction and uses of the ten groups of the transition elements.***

b) The scientific content of the practical part:
- ***Selected experiments for the preparation and identification of compounds and complexes of transitional elements and the study of their properties and their composition by the various physiochemical methods.***

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content.

5. Pre-requirements for this course (if any): *CHEM 221-4*

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

7. Course Main Objective(s)
This course aims to study the transition elements (d-block elements) and recognize their chemical and physical properties, and their various uses.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	55

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 on the properties, extraction and uses of the transition elements (d-block elements). (P)	K(1.1)	***Lecture / Open discussion in class***	***Objective Questions***
1.2	Describe the theories dealing with the formation of transition element complexes, magnetic properties, color , …… etc. (P)	K(1.2)	***Lecture / Open discussion in class***	***Objective questions, Essay questions***
2.0	Skills: (Upon completion of the course, student will be able to)			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Demonstrate the knowledge and skills required to solve problems in interpreting the properties and measurements of transition elements compounds. (P)	S(2.1)	*lecture / Open discussion in class*	*Essay questions, Solving problems*
2.2	Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments to prepare and analyze of transition elements' compounds and to write a report representing the scientific data. (P)	S(2.2)	*Lab work, group work*	*Objective question, Essay question, Practical Exam, lab report rubric*
2.3	Examine his material and lab safety background to follow proper procedures and regulations for safe handling and use of 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 in cooperation with other colleagues. (P)	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.	Introduction to the Transition elements and their general properties.	*9*
2.	Introduction to the different theories explaining the formation of complexes.	*6*
3.	Properties and uses of the scandium group's elements. Properties, extraction and uses of the titanium group's elements.	*3*
4.	Properties and uses of the chromium group's elements.	*2*
5.	Properties and uses of the manganese group's elements.	*2*

No	List of Topics	Contact Hours
6.	Properties and uses of the Iron group's elements.	***2***
7.	Properties and uses of the cobalt group's elements.	***2***
8.	Properties and uses of the nickel group's elements.	***2***
9.	Properties and uses of the copper group's elements.	***2***
10.	Properties and uses of the zinc group's elements.	***2***
11.	Selected Experiments related to course topics.	22
Total		55

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Lecture Quizzes***	***3-8***	***3 %***
2.	***Homework assignment***	***8***	***2 %***
3.	***Mid-term exam***	***6-8***	***15 %***
4.	***LAB Sheet***	***11***	***5 %***
5.	***Quiz in Safety***	***11***	***3%***
6.	***Final practical exam***	***11***	***9 %***
7.	***Lab report***	***2-10***	***10 %***
8.	***Group work evaluation***	***2-10***	***3%***
9.	***Final Exam***	12-14	***50 %***
	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	1-Concise Inorganic Chemistry, J. D. Lee, 5TH ED, Wiley India Pvt. Limited, 2008. 2- العناصر الانتقالية الأساسية وكيمياء التناسق، د. حسين محمد عبدالفتاح، د. سمير أبو القاسم عبداللطيف، الطبعة الثانية، دار النشر- الدولى 2012
Supportive References	1- Inorganic Chemistry: Principles of Structure and Reactivity, Okhil K. Medhi, James E. Huheey, Richard L. Keiter, Ellen A. Keiter, 4th Ed., Pearson Education Singapore Pte Ltd., 2006. 2- Advanced Inorganic Chemistry, Author: Cotton Wilkinson Murillo Bochmann, 6th Edition, Wiley India Pvt Ltd., 2012.
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	http://www.chemguide.co.uk/inorganic/transition/features.html http://www.chem.iitb.ac.in/~rmv/ch102/ic3.pdf

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

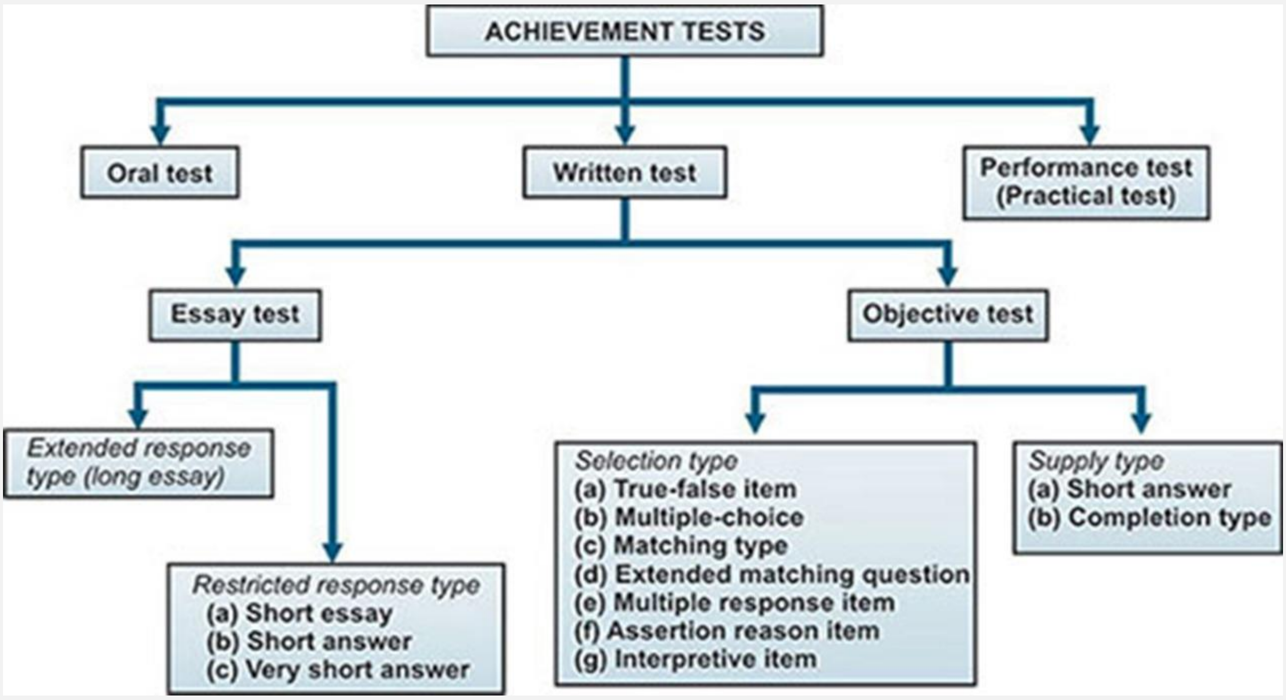
Week	EXPERMENTAL TITLE	Chemicals and Apparatus used	Remarks
1	Safety and regulations		
2	Preparation of nickel ammonium sulphate	Glassware - Nickel(II)sulphate hexa-hydrate - Ammonium sulphate.	None
3	Determination of nickel as the dimethylglyoximate	Glassware -1 % alcoholic solution of dimethylglyoxime - HCl (1:1) - Ammonia solution (1:1)	None
4	Determination of sulphate as barium sulphate	Glassware - Barium chloride solution (5%) - Concentrated hydrochloric acid.	None
5	Calculating of the empirical and the chemical formula of the double salt		None
6	Preparation of copper ammonium sulphate	Glassware - Copper(II)sulphate penta-hydrate. Ammonium sulphate and Acetone.	None
7	Determination of copper iodometrically	Glassware - (0.1 N) sodium thiosulphate. Potassium iodide (solid). Starch solution.	None
8	Determination of sulphate as barium sulphate	Glassware -Barium chloride solution (5%) - Concentrated hydrochloric acid.	None
9	Calculating of the empirical and the chemical formula of the double salt		None

2- Blue Print

Course Name	Chemistry of Transition Elements
Course Code	322CHEM -4

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	16	20	34	24	3	--	3	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (16M)	Quiz	Objective Q*	10	10	1
			Mid term	Objective Q	1	6	3
			Final Exam	Objective Q	1	12	12
	K2	1.2 (20M)	Quiz	Objective Q	10	10	2
			Mid term	Objective Q Essay Q**	1	10	5
			Final Exam	Objective Q Essay Q	1	13	13
Skills	S1	2.1 (34M)	H.W	Essay Q Solving Problems	4	10	2
			Mid term	Essay Q Solving Problems	2	14	7
			Final Exam	Essay Q Solving Problems	3	25	25
	S2	2.2 (24M)	Practical Sheet	Objective Q	2	10	5
			Lab Report	10 EXP.	10	10	10
			Final Lab Exam	Practical Exam	1	9	9
	S3	2.3 (3M)	Safety EXAM	Objective Q	9	9	3
Value	V1	3.1 (3)	Continuous assessment	Practical group work Rubric	-	3	3
	TOTAL	100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **CO-ORDINATION CHEMISTRY**
Course Code: **323CHEM-3**
Program: **Bachelor in Chemistry**
Department: **CHEMISTRY**
College: **SCIENCE**
Institution: **Jazan University (JU)**
Version: **T104 2022**
Last Revision Date: **28 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 9** **Year 3.**

4. Course general Description

This course aims to study the coordination and organometallic compounds, their methods of preparation and their uses.

Course Title	*Course Number*	*Contact Hours (CU)*		*Credit unit (CU)*	*Year*	*Level*	*Pre- requisite*
		Lec.	*Prac.*				
Coordination Chemistry	*CHEM 323*	*2*	*1*	*3*	*3*	*9*	*322CHEM4*

Course Objectives; They are to identify the following

1- Recognizing the stereochemistry of complexes and molecular symmetry.
2- Recognizing the concept of donating and accepting atom.
3- Recognizing the nomenclature rules of the complexes.
4- Recognizing the types of ligands and the coordination number.
5- Recognizing the polar and non-polar molecules.
6- Recognizing the methods of preparation of organometallic compounds.
7- Recognizing the uses of organometallic compounds.

*Syllabus: A-Theoretical **contents***

a. Coordination Chemistry: Concept of donating and accepting atoms – Types of ligands – Coordination number - Stereochemistry of complexes and molecular symmetry – Central atom groups - Nomenclature rules of the complexes – Crystal field theory – Molecular orbital theory.
b. Organometallic Chemistry: General rules – Different methods of preparation – Uses of organometallic compounds in the organic preparations (organic compounds of lithium, magnesium, boron, aluminum and silicon) – Organometallic compounds of transition elements, reactions of these compounds and their uses in organic preparations.

Syllabus: A-Practical contents

Selected experiments Selected experiments related to preparation and reactions of the complexes.

5. Pre-requirements for this course (if any):322chem

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

7. Course Main Objective(s)

This course aims to study the coordination and organometallic compounds, their methods of preparation and their uses.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	**22**	**100**
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 about the fundamentals and properties of main groups of transition elements in periodic table, coordination*	K(1.1	***Lecture / discussion Seminars /presentation***	***Objective Q***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	parameters, organometallic complexes etc .(P)			
1.2	*Describe the postulates of Werner theory, organometallic rules and coordination parameters. (P)*	K(1.2)	***lecture / discussion / Seminars /Individual presentation***	***Objective Q Essay Q***
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills to calculate the coordination number, CFSE, oxidation state of metal and magnetic moments (P)	S(2.1)	***lecture / discussion / Seminars /Individual presentation***	***Essay Q Solving Problems***
2.2	Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out 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	Examine his material and lab safety background to follow proper procedures and regulations for safe handling and use of 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 in cooperator with other colleagues. (P)	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.	***Definitions, series theory and Werner's theory and types of complexes***	**2**
2.	***Calculations of oxidation state of central atom and charge on the coordination sphere, factors affecting of the complex formation***	**2**

3.	*Effective atomic number rules, Nomenclature, magnetic susceptibility, coordination numbers and the stereochemistry and types of chelates*	4
4.	*Isomerisms of coordination compounds.*	3
5.	*bonding theories (VBT, CFT, CFSE and MOT)*	2
6.	*Reaction mechanisms of coordination compounds (substitutions and elimination reactions)- Inert and Labile reactions*	3
7.	*Principles, Nomenclature, Preparation, properties, reactions of organometallic compound*	2
8.	*–16 and 18 rules of organometallic compound*	2
9.	*Applications of coordination and organometallic compounds.*	2
10	***Selected experiments related to the course topic***	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.	**Practical work**	***LAB Sheet***	**11**	**5%**
5.		***Safety Exam***	**11**	**4%**
6.		***Final practical exam***	**11**	**7%**
7.		***Lab report***	**2-10**	**10%**
8.		***Group work evaluation***	**2-10**	**4%**
9.	***Final Exam***		**12-14**	**50%**
	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	Inorganic Chemistry: Principles of Structure and Reactivity, Okhil K. Medhi, James E. Huheey, Richard L. Keiter, Ellen A. Keiter, 4th Ed., Pearson Education Singapore Pte Ltd., 2006. Advanced Inorganic Chemistry, Author: Cotton Wilkinson Murillo Bochmann, 6th Edition, Wiley India Pvt Ltd., 2012.
Supportive References	Concise Inorganic Chemistry, J. D. Lee, 5TH ED, Wiley India Pvt. Limited, 2008. Introduction to Coordination Chemistry, G. A. Lawrance, A John Wiley and Sons, Ltd., 2010 Direct Synthesis of Coordination and Organometallic Compounds, A.D. Garnovskii and B.I. Kharisov, Elsevier Science, 1999.
Electronic Materials	Some course contents and materials are posted on Black board sites

Other Learning Materials	https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Modules_and_Websites_(Inorganic_Chemistry)/Coordination_Chemistry www.wikipedia.org/http://www.wpi.edu/Academics/Depts/Chemistry/Courses/General/

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

Practical contents

No. exp.	EXPERMENTAL TITLE	Equipment, Chemicals and Tools.	No of weeks for each experiment
1	General rules of safety		
2	Introduction about coordination chemistry and the safety in the laboratory.	Periodic table	One week
3	***Direct Titration*** Determination of Magnesium (II)	**0.01M of EDTA **Buffer (PH=10) **Soiochrome Black T (E.B.T) Indicator **Mg^{+2} solution	One week
4	***Direct Titration*** Determination of Zinc (II)	**0.01M of EDTA **Buffer (PH=10) **Soiochrome Black T (E.B.T) Indicator **Zn^{+2} solution	One week
5	***Direct Titration*** Determination of cadmium (II)	**0.01M of EDTA **Buffer (PH=10) **Soiochrome Black T (E.B.T) Indicator **Cd^{+2} solution	One week
6	***Direct Titration*** Determination of Copper (II)	**0.01M of EDTA **Buffer (PH=10) **Murexide (Indicator) **Cu^{+2} solution	One week
7	***Direct Titration*** Determination of Manganese (II)	**0.01M of EDTA **Buffer (PH=10) **Soiochrome Black T (E.B.T) Indicator **Mn^{+2} solution	One week
8	***Direct Titration Exps.*** Determination of Lead (II)	**0.01M of EDTA **Buffer (PH=10) **Soiochrome Black T (E.B.T) Indicator	One week

		Pb^{+2} solution	
9	***<u>Indirect and Back Titration Exps</u>.*** Determination of Aluminum (III)	**0.01M of EDTA ** 0.01 M Zinc Sulphates **Buffer (PH=10) **Soiochrome Black T (E.B.T) Indicator **Al^{+3} solution	One week
10	. ***<u>Indirect and Back Titration Exps</u>.*** Determination of Nickel (II)	**0.01M of EDTA ** 0.01 M Zinc Sulphates **Buffer (PH=10) ** Murexide (Indicator) ** Ni^{+2} solution	One week
11	***<u>Substitution Titration Exp</u>***. Determination of Calcium	**0.01M of EDTA **Ca^{+2} solution **Buffer (PH=10) **Magnesium Complex of EDTA (Mg-EDTA)	One week
12	***<u>InDirect Titration Exps</u>.*** Determination of Lead (II)	**0.01M of $MgSO_4$ **0.01M of EDTA **Buffer (PH=10) **Soiochrome Black T (E.B.T) Indicator Pb^{+2} solution	One week
13	Preparation and analysis of monooxalato iron(II) complex	** Glassware. ** Ferrous sulfate ** Ferrous ammonium sulphate. **oxalic acid dihydrate. ** Acetone. ** Ni^{+2} solution	One week
14	Preparation and characterization of potassium trisoxalatochromate(III) trihydrate **$K_3[Fe(C_2O_4)].3H_2O$**	** Glassware. **chromium sulfate ** Potassium dichromate ** Potassium oxalate monohydrate	One week

		** Oxalic acid dihydrate ** Sulphuric acid ** Potassium permanganate ** Ammonoium persulphate ** H_2O_2 ** Ethanol	
15	Preparation of potassium cis and trans-diaqua dioxalato chromate (III). **Cis &Trans $K[Cr(C_2O_4)_2(H_2O)_2]$**	** Glassware. ** chromium sulfate ** Potassium dichromate ** Potassium oxalate monohydrate ** Oxalic acid dihydrate ** Ethanol	One week

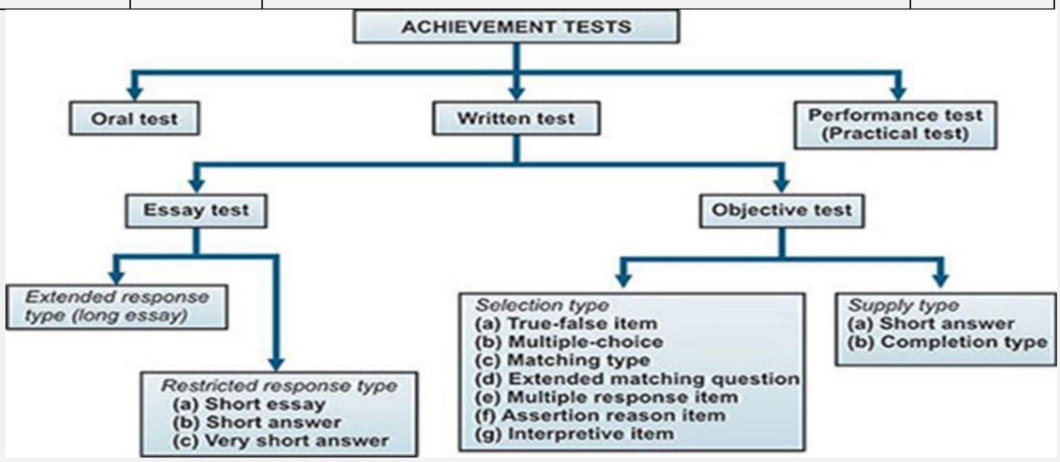
Instructors conducts selected Exps from the Table according to the availability of materials and discussions with coordiators.

2- Blue Print

Course Name	Co-ordination Chemistry
Course Code	323 CHEM3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
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 (15M)	Quiz	Objective Q *	2	2	1
			Mid term	Objective Q	6	3	3
			Final Exam	Objective	22	11	11
	K2	1.2 (21M)	Quiz	Objective Q	1	1	1
			Mid term	Objective Q Essay Q**	3	5	5
			Final Exam	Objective Q Essay Q	10 4	5 10	15
Skills	S1	2.1 (34M)	H.W	Essay Q Solving Problems	4	2	2
			Quiz	Objective Q Essay Q	1	1	1
			Mid term	Essay Q Solving Problems	3	7	7
			Final Exam	Essay Q Solving Problems	7	24	24
	S2	2.2 (22M)	Practical Sheet	Objective Q	6	3	3
			Lab Report	Objective Q Essay Q	2	2	2
				10 EXP.	10	10	10
			Final Lab Exam	Practical Exam	1	7	7
	S3	2.3 (4M)	Safety Exam	Objective Q	8	4	4
Value	V1	3.1 (4)	Continuous assessment	Practical group work Rubric	-	4	4
	TOTAL	100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	Heterocyclic Organic Chemistry
Course Code:	333CHEM-3
Program:	Bachelor of Science in Chemistry
Department:	Chemistry
College:	Faculty of Science
Institution:	Jazan University (JU)
Version:	T104 2022
Last Revision Date:	29 December 2022

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered:	Level 7 Year 3

1. Course Description

Course Title	*Course Number*	*Contact Hours (CU)*		*Credit unit (CU)*	*Year*	*Level*	*Pre- requisite*
		Lec.	*Prac.*				
Heterocyclic Organic Chemistry	333CHEM-3	2	2	3	3	7	232CHEM-3

Course objectives:

1. Identification and classification of heterocyclic organic compounds.
2. To identify the physical properties of heterocyclic organic compounds.
3. Study of the addition reactions, the electrophilic and nucleophilic substitution reactions on a five and six-membered ring with one and two heteroatoms.

❖ **Syllabus: A-Theoretical contents**

Definition, classification and nomenclature of heterocyclic organic compounds - physical properties of heterocyclic compounds – Addition reactions, elctrophilic and nucleophilic substitutation reactions of five and six-membered rings with one or two heteroatoms- pyrrole, furan, thiophene , pyrazole , imidazole, oxazole, thiazole, isothiazole, azine, thiazine, pyridine, alkyl pyridine, pyridazine, pyrimidine and quinoline – Synthesis of five and six-membered rings with one or two heteroatoms - some poly-heterocyclic compounds - synthesis and reactions.

❖ **Syllabus: B-Practical contents**

Investigation and identification of organic compounds

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

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

7. Course Main Objective(s)

This course aims to provide student with basic knowledge of heterocyclic organic compounds, their physical and chemical properties and their most important chemical reactions.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad, knowledge and understanding in heterocyclic topic as Nomenclature of heterocyclic compounds , Five-Membered rings with one hetero atom , Fused benzene ring Five-Membered rings with one hetero atom , Five-Membered rings*	*K(1.1)*	*lecture / discussion Seminars /presentation*	*Objective question*

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	with two hetero atom, Six-Membered rings with one hetero atom , Fused benzene ring Six-Membered rings with one hetero atom , important of Biological activities of heterocyclic compounds (P)			
1.2	*Describe the aromatic character of some heterocyclic compounds and giving explanation to some of their synthetic methods. (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 to interpret products obtained from different reaction conditions regarding heterocyclic chemistry (P)*	*S(2.1)*	*lecture / discussion / Seminars /Individual presentation*	*Objective question*
2.2	*Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments as well as accurately record and analyze the results of such experiments. (P)*	*S(2.2)*	*Lab work, group work*	*Objective 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*	*Quiz in Safety*
3.0	Values, autonomy, and responsibility; (Upon completion of the course, student will be able to)			
3.1	*Work as a group leader in cooperation with other colleagues (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.	Introduction of heterocyclic compounds Nomenclature of heterocyclic compounds Nomenclature of one ring heterocyclic compounds with one heteroatoms (N,O,S)	2
2.	Nomenclature of heterocyclic compounds: Nomenclature of one ring heterocyclic compounds with two or more heteroatoms (N,O,S). Nomenclature of fused ring heterocyclic compounds with one or more heteroatoms (N,O,S).	3
3.	Five-Membered rings with one hetero atom Pyrrole (Azole), Furan and Thiophene (Methods of preparation, Physical properties and structure, Chemical properties) Reactions : (basicity ; acidity properties) .	4
4.	Fuse ring Five-Membered rings with one hetero atom Indole – benzofuran- benzothiophene (Methods of preparation, Physical properties and structure, Chemical properties.	3
5.	Five-Membered rings with two hetero atoms Pyrazole and Imidazole (Methods of preparation, Physical properties and structure , Chemical properties)	2
6.	Six-Membered rings with one hetero atom \Pyridine (Methods of preparation. Physical and chemical properties Derivative of pyridine (alkyl pyridine, amino pyridine) Six-Membered rings with two hetero atom Pyradiazine, pyrimidine, pyrazine (Methods of preparation. Physical properties and Chemical properties	4
7.	Fused Six-Membered rings with one hetero atom Quinoline and isoquinoline (Methods of preparation. Physical properties and chemical properties.	3
8.	Six membered rings with one oxygen atom (Pyran-Coumarin-4-Chromone) Six-membered rings with two different heteroatoms (Morpholine-piperazine-phenoxazine)	1
9	***Selected experiments related to the course topic***	22
	Total	

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		4-7	3 %
3.	Mid-term exam		5-7	15 %
4.	LAB	LAB Sheet	12	7 %
5		Safety EXAM	11	3%
6		Final practical exam	12	7 %
7		Lab report	2-11	10 %
8		Group work evaluation	2-11	3%
9	Final Exam		12-14	50 %
	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	Introduction to Heterocyclic Chemistry, Peter A. Jacobi ISBN: 978-1-119-41768-2 August 2018 272 Pages
Supportive References	1. Heterocyclic chemistry; Gilchrist, T. L. 3rd ed.; Addison Wesley Longman: Edinburgh Gate, 1997. 2. Heterocyclic chemistry; Joule, J. A.; Mills, K.; 4th ed.; Blackwell Science: Oxford, 2000. 3. Heterocyclic Chemistry, R. R. Gupta, M. Kumar, V. Gupta, Volume II: Five-Membered Heterocycles, Springer, ISBN 978-3-642-08460-7, 1999.
Electronic Materials	• https://b-ok.asia/book/829427/cae9f4 https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry)/15%3A_Benzene_and_Aromaticity/15.06%3A_Aromatic_Heterocycles-_Pyridine_and_Pyrrole
Other Learning Materials	Computer-based programs/ ChemDraw

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students

Items	Resources
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

Attachment:

1- EXP. Table

No.	List of Topics	APPARATUS	CHEMICALS	Week
1	Safe handling when using chemicals	Smart board, Data show, Black board, internet	NaOH, Conc. HNO_3, Conc. H_2SO_4, ethanol, benzene	1
2	Qualitative Analysis of Organic Compounds. Preliminary Tests - Physical Constants Analysis for elements present- Solubility tests	Flame distilled water - test tubes – Beaker- flask	Litmus paper Simple salts of organic compound such as (oxalic acid-benzoic acid-aniline HCl-Urea- Glucose 1-Naphthylamin 1-naphthole	1
3	Qualitative Analysis for Elements Lassaigne's Sodium Fusion Test - Heat Test. Heating with soda lime - Nitration - Sulphation Treatment with NaOH- Treatment with $FeCl_3$	Flame distilled water - test tubes – Beaker-flask	Litmus paper Simple salts of organic compound such as (oxalic acid-benzoic acid-aniline HCl-Urea- Glucose 1-Naphthylamin 1-naphthole Reagents :- NaOH, $FeCl_3$, conc. HNO_3, conc. H_2SO_4, soda lime,	1
4	Identification of organic compounds Combination of (H, C,O) [Carbohydrate, Carboxylic acid, phenols]	Flame distilled water - test tubes – Beaker-flask	Carbohydrate Molisch Test. Benedict's Test Barfoed's Test Bial's test Seliwanoff's Test Carboxylic acid Acidity test Nitration $FeCl_3$ test $CaCL_2$ test Phthalein test Phenols Phenol, resorcinol, cresol 1-naphthol	2
5	Combination of (H, C,O and metallic) [Salts of acid]	Flame distilled water - test tubes – Beaker-flask	Heat test Nitration $FeCl_3$ test $CaCL_2$ test Phthalein test	1
6	Combination of (H, C,O and N) [Amm. Salts, Amide, imides]	Flame distilled water - test tubes – Beaker-flask	Simple of amm. Salts Acidity test Nitration $FeCl_3$ test $CaCL_2$ test Phthalein test Urea, imide NaOH test $CuSO_4$	2

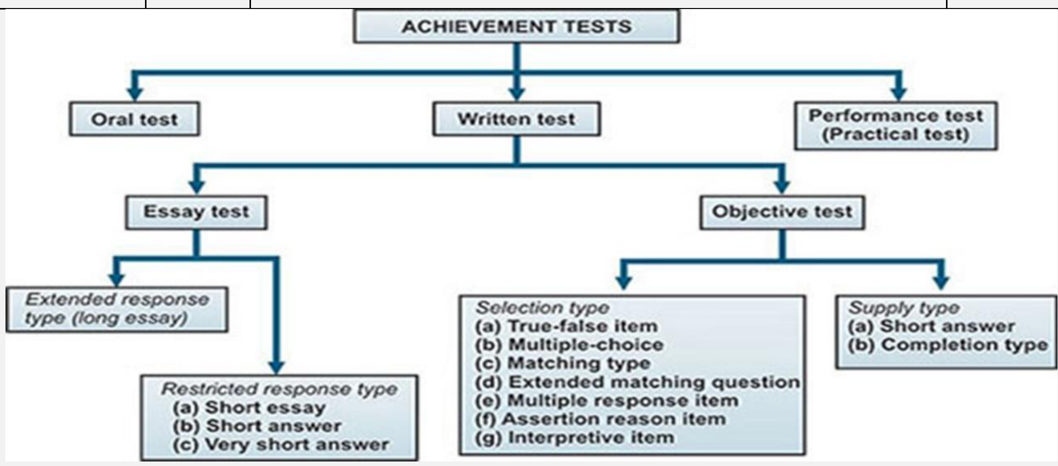
7	Combination of (H, C,O, N,S)	Flame distilled water - test tubes – Beaker-flask	Aniline H_2SO_4 Thiourea, Sulphaline acid	**1**
7	Combination of (H, C,O, N, X)	Flame distilled water - test tubes – Beaker-flask	Aniline HCl Chlorale	**1**
8	Review	Flame distilled water - test tubes – Beaker-flask	Carbohydrate Carboxylic acid Salts of acids Amm. salts	**1**
9	Final Exam.			**11**

2- Blue Print

Course Name	Heterocyclic Organic Chemistry
Course Code	333CHM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	17	23	30	24	3	0	3	

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (17 M)	Quiz	**Objective test**	1	1	1
			Homework		4	1	1
			Mid term		1	5	5
			Final Exam		1	10	10
	K2	1.2 (23 M)	Quiz	**Objective test** ***Essay question***	2	2	2
			Homework		3	1	1
			Mid term		2	5	5
			Final Exam		2	15	15
Skills	S1	2.1 (30 M)	Midterm	***Essay question***	2	5	5
			Final Exam		3	25	25
	S2	2.2 (24M)	Practical Sheet	Objective test	3	7	7
			Lab Report	Lab Report Rubric	---	10	10
			Final Lab Exam	Report of Lab Exam	7	7	7
	S3	2.3 (3 M)	*Safety EXAM*	Objective test	8	3	3
Value	V1	3.1 (3 M)	Continuous assessment	Group evaluation rubric	-	3	3
	TOTAL	100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Spectroscopy of Organic Compound**
Course Code:	**334CHEM2**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**22 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	2h
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered: Level 9 / Year 3	
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Spectroscopy of Organic Compounds	*334CHEM2*	*2*	*0*	*2*	*3*	*9*	*232CHEM3*

This course aims to give students the basic knowledge of different regions of electromagnetic radiations and their properties to develop skills in elucidation of the molecular structure of organic compounds

Course objectives: They are to identify the following.

- ***To understand different regions of electromagnetic radiations and their interaction with atoms and molecules.***
- ***To identify the spectra due to the electronic absorption.***
- ***The basic principles of nuclear magnetic resonance spectroscopy***.

Syllabus: A-Theoretical contents

Empirical, Molecular, Structural formula and Index of hydrogen deficiency. The electromagnetic radiations - interaction with atoms and molecules – the electronic absorption

– Ultra violet and visible spectroscopy (UV) – effect of molecular structure and stereochemistry of compounds on electronic absorption – Infra red spectroscopy (IR) – effect of molecular structure on stretching and bending vibrations (conjugation – induction – hydrogen bonding – stereo positions) – Nuclear magnetic resonance spectroscopy – the magnetic nuclei – effect of external magnetic field on magnetic nuclei – shielding and deshielding effect - spinning protons – splitting of signals– chemically and magnetically equivalent protons – integration – coupling constant – exchangeable protons with deuterium – mass spectrometry – formation of molecular ion – rules of fragmentation of molecular ions – isotopes in nature – molecular ion area – high resolution mass spectrometry.

Syllabus: A-Practical contents

none

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

232CHEM3

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

none

7. Course Main Objective(s)

This course aims to give students the basic knowledge of different regions of electromagnetic radiations and their properties to develop skills in elucidation of the molecular structure of organic compounds

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge and understanding in spectroscopy, electromagnetic radiation, chromophore, Auxochrome its applications., etc (P)*	K (1.1)	Lecture group work discussion	Objective Q
1.2	*Describe the essential facts, principles and theories related to spectroscopic chemistry and its uses in identification of simple organic compounds ,etc (P)*	K(1.2)	Lecture group work discussion	Short answer Questions
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	*Use numeracy skills in calculating λmax for identification of organic compounds, Label the components of the instrument to be used for each spectral method and its work, analyze experimental data obtained from different spectroscopy charts… (P)*	S(2.1)	lecture group work discussion	Solving Problems & chart analysis
2.2	*access useful and specialized sites on the internet, in order to search and select specific information about spectroscopic topics (I)*	S((2.4)	project-based learning Technology-enabled learning	Research presentatio n rubric
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	*Act with integrity and good ethics in chemistry profession and their obligation to society (M)*	V(3.2)	Research activities	Ethic check rubric

C. Course Content

No	List of Topics	Contact Hours
1.	*Empirical, Molecular and Structural formula. Index of hydrogen deficiency*	*1*
2.	*What is light and electromagnetic radiation - Interaction between light and matter.*	*1*
3	*UV Spectroscopy: Ground and excited states, Lambert-Beers law and types of bands, molar absorptivity, a calculation of λ_{max} to the possible structure. The Woodward-Fieser roles for dienes and Carbonyl compounds,*	*2*

	enones.	
4	*infrared spectroscopy: Infrared absorption process - Instrumentation - Sample preparation (solid, liquid and gas), types of vibrations, H00k s law and its application.*	*2*
5	*Characteristic infrared bands of different organic functional groups: hydrocarbons, alcohols and phenols, ethers, Amines, Alkyl and aryl halides. Carbonyl compounds, Factors influence the carbonyl group, aldehydes, ketones, carboxylic acids, esters, amides, acid chlorides, anhydrides. Nitriles, …*	*2*
6	*Applications of IR in identification of organic compounds.*	*2*
7	*Nuclear Magnetic Resonance Spectroscopy: Nuclear spin states - Nuclear magnetic moments -Absorption of energy, The mechanism of absorption (Resonance)- NMR spectrometer.*	*3*
8	*Chemical and magnetic equivalence and non-equivalence. Integrals and integration- Chemical environment and chemical shift- Shielding and deshielding. Local diamagnetic shielding: Electronegativity effect, Hybridization effects, acidic and exchangeable protons, H-bond. Magnetic anisotropy. Spin →Spin coupling and coupling constant.*	*2*
9	*13C NMR spectroscopy (chemical shift); more complex spin-spin splitting patterns*	*2*
10	*Mass spectroscopy: Ionization of the compounds and formation of molecular ion*	*1*
11	*Rules of fragmentation and Some applications.*	*2*
12	*Spectroscopic identification of Organic compounds: how to use the synergistic information afforded from the combination of mass, UV, IR and NMR spectra to identify the structure of an organic molecule.*	*2*
	Total	*22*

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Homework assignment*	*2-5*	*2*
2.	*Lecture Quizzes (Q1)*	*3*	*2*
3.	*Mid-term exams. (MID.)*	*4-9*	*30*
4.	*Lecture Quizzes (Q2)*	*7*	*3*
5.	Research Presentation	*9*	*3*
	Final Exam	*12-14*	*60*
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	Introduction to spectroscopy, D.L.Pavia, G.M.Lampnon , .S.Kriz,3rd ed.2000, Brooks, Cole Pub.Co
Supportive References	• Spectroscopy of Organic Compounds 6th ed., Kalsi, New Age International (p) Ltd, 2004 • Introduction to Spectroscopy, 5th Edition AUTHORS: Pavia/Lampman/Kriz/Vyvyan - ©2015
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

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 & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G - 18/06/1444H**

H. Attachments

1- Practical Work

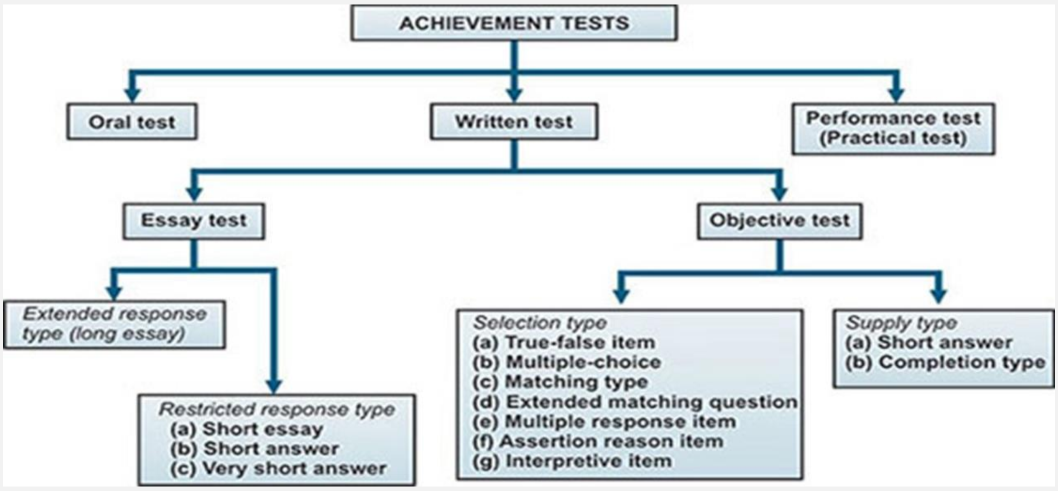
None

2- Blue Print

Course Name	SPECTROSCOPY OF ORGANIC COMPOUNDS
Course Code	334 CHEM2

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	--	--	2.2	--	3.1
Marks	15	25	53	--	--	4	--	3

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding			Quiz	Objective Q	3	3	3
	K1	1.1 (15 M)	Midterm	Objective Q	4	2	2
			Final Exam	Objective Q	5	10	10
	K2	1.2 (25 M)	HW	Objective Q	8	4	4
			Midterm	Objective Q	5	5	5
			Final Exam	Objective Q	16	16	16
Skills	S1	2.2 (53 M)	Homework	Solving problems	2	1	1
			Midterm	Solving problems and spectral data analysis	6	18	18
			Final Exam	Solving problems and spectral data analysis	7	34	34
	S4	2.4 (4M)	Research Presentation	Combined Spectra	-	1	1
				data analysis	-	1	1
				structural elucidation	-	2	2
Value	V2	3.1 (3 M)	Research ethic check	Plagiarism check	-	3	3
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

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

Table of Contents:

Content	Page

A. General information about the course:

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 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 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.
*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 • Traditional classroom • E-learning		
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)	
	Total	44

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.	***Group work evaluation***	**Through Semester**	**4%**
9.	***Final Exam***	**12-14**	**50%**
	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	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. 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	***Student***	***Likert-type Survey (CES)*** ***Indirect***
Effectiveness of student's 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		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

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

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.	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 ($CaCl_2$-$FeCl_3$- NH_4OH-NaOH, $KMnO_4$- H_2SO_4-Con. HCl-$NaHCO_3$- Na_2CO_3-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($CaCl_2$-$FeCl_3$-H_4OH-$NaOHKMnO_4$-H_2SO_4-Con.HCl-$NaHCO_3$-Na_2CO_3-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 ($CaCl_2$-$FeCl_3$-NH_4OH, NaOH- $KMnO_4$-H_2SO_4-Con.HCl-$NaHCO_3$-Na_2CO_3-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 ($CaCl_2$-$FeCl_3$-NH_4OH-$NaOHKMnO_4$-H_2SO_4-Con. HCl-$NaHCO_3$-Na_2CO_3- Resorcinol-	1	2

			Phenol-1-naphthol-Feling regents-Berfored 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 ($CaCl_2$-$FeCl_3$-NH4OHNaOH- $KMnO_4$-H_2SO_4-Con. HCl- $NaHCO_3$-Na_2CO_3- 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 ($CaCl_2$-$FeCl_3$-NH_4OHNaOH- $KMnO_4$-H_2SO_4-Con. HCl- $NaHCO_3$-Na_2CO_3- 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

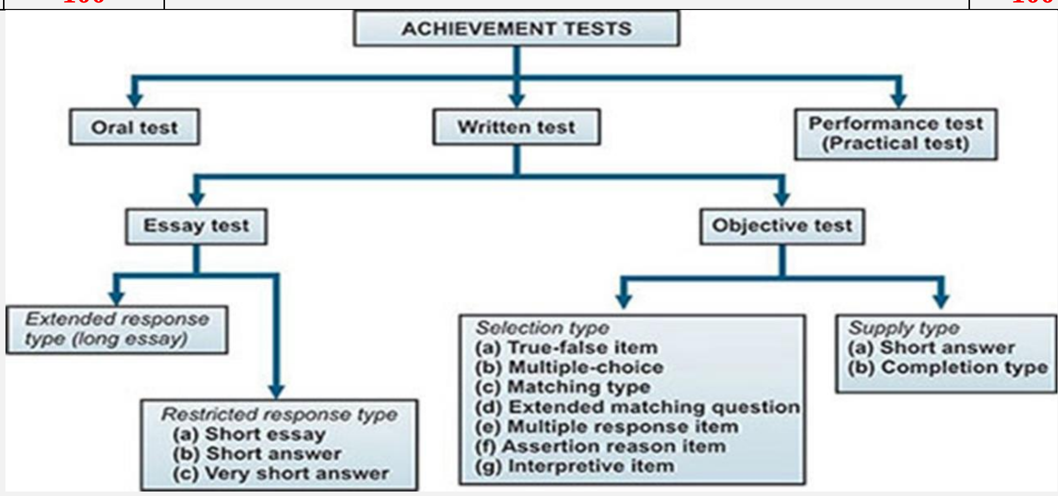
		plate measuring cylinder.	metal lic and Salts of ammonium) -Regent ($CaCl_2$-$FeCl_3$-NH_4OH-NaOHKMnO_4-H_2SO_4-Con. HCl-$NaHCO_3$-Na_2CO_3- Resorcinol-Phenol- ethanol-methanol.		
10	Final exam			**11**	**22**

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	Assessme nt Type	Assessme nt Tool	No of Question s	Marks of the Assessme	Weight of the Assessme
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



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**CHEMICAL KINETICS**
Course Code:	342CHEM-3
Program:	Bachelor in Chemistry
Department:	Chemistry
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**12 January 2023**

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	3hrs
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered:	Level 7 Year 3
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Chemical kinetics	*342CHEM-3*	*2*	*2*	*3*	*3rd*	*7*	*241CHEM-3*

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

1.The laws of reaction rate for different chemical reaction,

2.Temperature effect on the reaction rate and Arrhenius equation.

3.Collision theory of unimolecular and bimolecular reaction.

Syllabus: A-Theoretical contents

General concepts of chemical kinetics; rate of reaction and factors affecting on it , the reaction rate constant, order and Molecularity, pseudo- order reactions, the rate equations and half- life period- The derivation of the different rate laws and half- life period, zero, 1st, 2nd, and 3rd order reactions- Determination of the order of the reaction; integration, graphical, half- life period, Van,t Hoff,s differential and Ostwald isolation method-Rate laws for complex reactions; parallel, consecutive and chain reactions-Temperature effect on reaction rate- Derivation of Arrhenius equation- Determination of the activation energy of the chemical reactions – Effect of the catalyst on the activation energy-Reaction rate theories; Collision theory and Transition state theory.

Syllabus: B- Practical contents

Experimental work illustrating selected parts of the theoretical content.

**See attachment*

5. Pre-requirements for this course (if any): *241CHEM3*

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

7. Course Main Objective(s)

This course aims to give the students, knowledge about the principles of chemical kinetics.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	***22***	***100%***
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge and understanding on principal of chemical kinetics, Concepts and terminology of chemical kinetics topics including; rate of reaction and factors affecting on it , the reaction rate constant and its units, order and Molecularity, pseudo- order reactions, the rate equations ,half-life period, complex reactions, activation energy … etc(P)***	K(1.1)	***Lectures, Class Discussion***.	***Objective question***s.
1.2	***Describe the different phenomena associated with chemical kinetics;***		***Lectures, Class Discussion.***	***Essay questions.***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	the different factors that can affect the rate of the chemical reactions, the difference between order and Molecularity, methods of determination of the order of the reaction, Effect of the catalyst on the activation energy, collision theory and transition state theory… etc *(P)*	K(1.2)		
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	*Demonstrate the gained knowledge and skills to solve problems associated with different topics in the course as the reaction rate, the rate constant, half-life period, order of the reaction, the activation energy from applying the Arrhenius equation, Arrhenius factor, collision constant. (P)*	S(2.1)	*Lectures, Class Discussion.*	*Solving Problems.*
2.2	*Perform experiments in chemical kinetics, record, analyze, interpret the scientific data, and write reports. (I)*	S(2.2)	*Lab work, group work*	*Objective questions, Essay questions,* *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 in cooperation with other colleagues. (P)*	V(3.1)	*lab demonstrations , whole group and small group discussion*	*Practical group Leader Rubric*

C. Course Content

No	List of Topics	Contact Hours
1.	***General concepts of chemical kinetics.***	*4*
2.	***Simple reactions; zero, 1st, 2nd, and 3rd order reactions.***	*6*
3.	***Determination of the order of the reaction; integration, graphical, half- life period, Van't Hoff's differential and Ostwald isolation method.***	*3*
4.	***Complex reactions; parallel, consecutive and chain reactions.***	*3*
5.	***Arrhenius equation.***	*2*
6.	***Collision theory.***	***2***
7.	***Transition state theory.***	***2***
8.	***Selected experiments related to the course topics***	***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***	***5 %***
2.	***Mid-term exam.***	***6-8***	***15 %***
3.	***LAB Sheet.***	***11***	***5 %***
4.	***Quiz in Safety.***	***11***	***3%***
5	***Final practical exam.***	***11***	***9 %***
6	***Lab report.***	***2-10***	***10 %***
7	***Group Leader evaluation.***	***2-10***	***3%***
8	***Final Exam.***	***12-13***	***50%***
	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	• ***Chemical Kinetics and Reaction Dynamics,*** 1st edition, ***Paul L. Houston, 2006.*** • ***Chemical Kinetics and Reaction Dynamics, Santosh K. Upadhyay, Springer, 2006, ISBN 1-4020-4546-8 (HB) - ISBN 1-4020-4547-6 (e-book)*** • ***Principles of Chemical Kinetics ,*** **2nd edition,** ***James E. House, 2007.***
Supportive References	***Atkins' Physical Chemistry 11e: Volume 1: Thermodynamics and Kinetics Oct 30, 2018***

	اساسيات الحركية الكيميائية – د فكيهة محمد الطيب هيكل - دار النشر الدولي - الطبعة الأولى 2003 م
Electronic Materials	***course contents and materials are posted on Black board sites.***
Other Learning Materials	https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=kinetic+energy&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	***1 Lecture room(s) for groups of 50 students*** ***1 Lab room for group of 25 students.***
Technology equipment (projector, smart board, software)	***Smart board, Data show, Internet*** ***1 Computer laboratory for groups of 25 students.***
Other equipment (depending on the nature of the specialty)	***Water distillation device, Ice maker, water bath and Balance.***

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

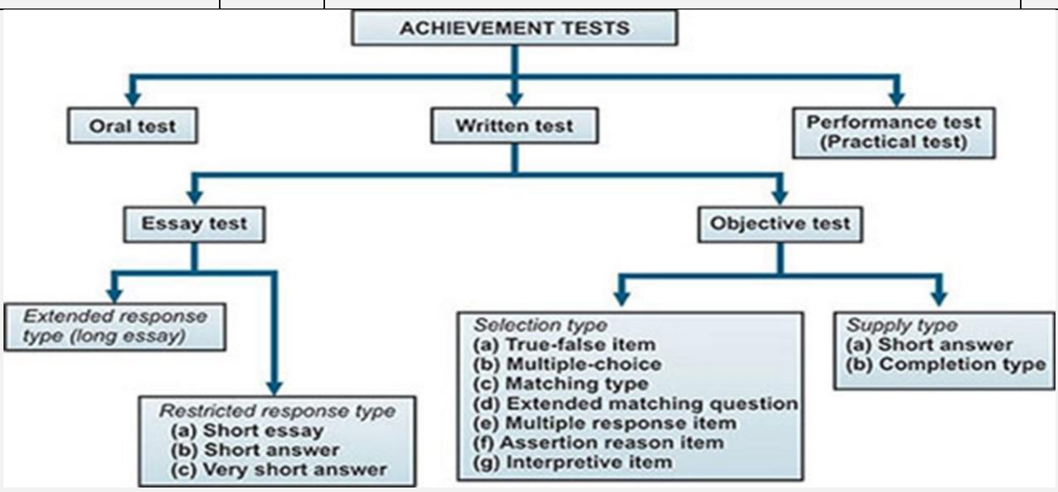
Week	Experimental Title	Chemicals used	Remarks
1	*Introduction and lab safety*		
2	*Catalytic decomposition of hydrogen peroxide*	*H_2O_2, KMnO4, sulphuric acid and MnO_2*	*None*
3	*Kinetic study of hydrolysis of ethyl acetate catalyzed by acid*	*Ethyl Acetate,HCl, Phenolphthalein and NaOH*	*None*
4	*Saponification of ethyl acetate.*	*Ethyl Acetate, Phenolphthalein and NaOH*	*None*
5	*Determination of rate constant of Iodination of acetone reaction*	*Acetone, Iodine solution, sulphuric acid, sodium thiosulphate, Starch indicator and Sodium acetate*	*None*
6	*Effect of temperature on the reaction rate of hydrolysis of ethyl acetate catalyzed by acid and calculation of activation energy*	*ethyl acetate, Sodium acetate and Hydrochloric acid*	*None*
7	*Determination of rate constant of persulphate–iodide reaction*	*Potassium persulphate Potassium iodide, Sodium thiosulphate and Starch indicator.*	*None*
8	*Reaction rate of magnesium and hydrochloric acid*	*Magnesium and Hydrochloric acid*	*None*
9	*Revision*		
10	*Final Exam*		

2- Blue Print

Course Name	**Chemical Kinetics**
Course Code	**342 CHEM-3**

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	18	18	34	24	3	--	3	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (18M)	***H.W***	***Objective question***	4	1	1
			Mid term	***Objective question***	8	4	4
			Final Exam	***Objective question***	13	13	13
	K2	1.2 (18M)	***H.W***	***Essay question***	2	1	1
			Mid term	***Essay question***	2	4	4
			Final Exam	***Essay question***	6	13	13
Skills	S1	2.1 (34M)	***H.W***	***Solving Problems***	3	3	3
			Mid term	***Solving Problems***	3	7	7
			Final Exam	***Solving Problems***	6	24	24
	S2	2.2 (24M)	***Practical Sheet***	***Objective question***	6	3	3
				Essay question	2	2	2
			Lab Report	***Lab report***	7	10	10
			Final Lab Exam	***Lab Exam***	1	9	9
	S3	2.3 (3M)	***Safety Quiz***	***Objective question***	6	3	3
Value	V1	3.1 (3 M)	***Continuous assessment***	***Group Leader evaluation rubric***	-	3	3
	TOTAL	100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	Surface Chemistry &Catalysis
Course Code:	**343CHEM -3**
Program:	Bachelor in Chemistry
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T-104 2022**
Last Revision Date:	**23 December 2022**

Table of Contents:

A. General information about the course:

Course Identification	
1. Credit hours:	**3hrs**
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered: level 8 / Year 3	
4. Course general Description:	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre- requisite*
		Lec.	*Prac.*				
Surface Chemistry & Catalysis	*CHEM343-3*	*3*	*0*	*3*	*3*	*8*	*241CHEM3*

Course objectives: They are to identify the following.

- Basic principles of surface, catalysis, colloid and adsorption processes

- Parameters affecting on catalytic reactions, surface tension and colloids.

- Identification of different catalytic theories, adsorption and origin of charge on colloid.

- The application of surface, catalysis, colloidal and adsorption processes.

Syllabus: A-Theoretical contents

Adsorption and its type, factors affecting on it, Gibbs and Langmuir theory for adsorption and its application on the surface area and calculations concerning with them. Intermediate compounds and adsorption theories. Homogeneous and heterogeneous catalysis, (Enzymes), Colloids, its type, methods of preparation and its properties, theories for catalysis applications on the chemical process and heterogeneous catalyst.

Syllabus: B-Practical contents:

none

5. Pre-requirements for this course (if any): 241CHEM3

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

none

7. Course Main Objective(s): ***The course is designed to give the students' knowledge about catalytic reactions, catalyst and its different applications, and colloids also studying surface chemistry and adsorption, especially on solid surfaces.***

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	---
3.	Field	---
4.	Tutorial	---
5.	Others (specify)	---
	Total	33

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 an understanding of the concepts of surface, catalyst, colloidal and its mechanisms and applications (P)***	***K1***	***Lecture, Open discussion in class***	***MCQ Quizzes H.W.***
1.2	***Describe the essential facts, principles and theories across the modeling isotherm, surface tension laws, theories of***	***K2***	***Lecture, Group work discussion***	***MCQ Labeling diagrams***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	catalysis, preparation of colloids. (P)			
…				
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	*Demonstrate an ability in critical thinking, analytical reasoning and solving problems concerning with surface chemistry and adsorption (P)*	*S1*	*Lecture,* *Group work discussion*	*Oral, solve problems* *H.W.*
2.4	*use of communication, modern library searching and information technology about chemistry topics (I)*	*S4*	*web-based work* *Researches individual research projects, oral presentation*	*Research presentation*
…				
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1				
3.2	*Act with integrity and good ethics in chemistry profession and their obligation to society* (M)	V2	*Research activities*	*Plagiarism check*
…				

C. Course Content

No	List of Topics	Contact Hours
1.	*Meaning of surface / surface tension, parameters affect s on the surface*	**6**
2.	*Criteria for surface phenomenon and spreading of liquid, contact angle, adhesion and cohesion force*	2
3.	*Adsorption of gas on solid, isotherm (Freundlich, Langmuir and BET), applications*	6
4.	*Gibbs equation, spreading of liquids*	***3***
5.	*Catalysis theories, applications*	***6***
6.	*colloids and its applications*	***6***
7.	*Presentation Session*	2
8.	*General revision*	***2***
Total		33

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***HW***	***4-8***	***5***
2.	***Mid-term exams***	***6-9***	***25***
3.	***Seminar/ Presentation Session***	***10***	***6***
4.	***Ethic check***	***10***	***4***
5.	***Final Exam***	***12-13***	***60***
	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	مبادئ الكيمياء الفيزيائية المطورة الطبعة الثانية، دار المعارف القاهرة ا.د. محســـن الصباح ا.د. السيد علي حسن 1999 ***2- Handbook of Surface and Colloid Chemistry, Third Edition by K. S. Birdi 20, 2008.*** ***3- Essentials of Physical Chemistry, Arun Bahl, 26th. Ed (2018) B.S. Bahal, G.D. Yuli.***
Supportive References	***1- Physical Chemistry, James Keeler 11th .Ed.(2018) J.de Paula & P. Atkins.*** ***2- R. I. Masel, "Principles of Adsorption and Reaction on Solid Surfaces", Wiley Series in Chemical Engineering, Wiley-Inter science, New York, USA, 1996, ISBN 978-0-471-30392-3***
Electronic Materials	***Some course contents and materials are posted on Black board sites-***
Other Learning Materials	• ***www.wikipedia.org/*** • https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=surface+chemistry&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room(s) for groups of 40 students.
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	***none***

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 & indirect)
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

None

2- Blue Print

Course Name	**Surface Chemistry & Catalysis**
Course Code	CHEM343-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	--	--	2.4	--	3.2
Marks	15	25	50	--	--	6	--	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 test	3	3	4
			HW	Objective test	2	2	1
			Final Exam	Objective test	2	10	10
	K2	1.2	Mid-term	Objective test	2	6	7

		(25 M)	HW	Objective test	2	2	1
			Final Exam	Objective test	2	17	17
Skills	S1	2.1 (50 M)	Mid-term	Essay test , Solving Problems, comparison & chart analysis	2	16	14
			HW	Essay test, Solving Problems, comparison & chart analysis	3	3	3
			Final Exam	Essay test, Solving Problems, comparison & chart analysis	2	33	33
	S4	2.4 (6 M)	Research presentation	Research rubric	-	-	2
				PPT presentation rubric			2
				Oral discussion			2
Value	V2	3.2 (4 M)	Presentation ethic check	Plagiarism check rubric	-	-	4
TOTAL		100					100

Achievement tests			
Written test			
* Essay test		* Objective test	
Extended response type	Restricted response type	Selection type	Supply type
(long essay)	a) Short essay b) Short answer c) Very short answer	a) True-false item b) Multiple-choice c) Matching type d) Extended matching question e) Multiple response item f) Assertion reason item g) Interpretive item	a) Short answer b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**ELECTROCHEMISTRY**
Course Code:	**344 CHEM -3**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University**
Version:	**T-104 2022**
Last Revision Date:	**5 February 2023**

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	3hs
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered:	Level 8 Year 3
4. Course general Description	

Course Title	*Course Number*	*Contact Hours*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Electrochemistry	*344CHEM-3*	*2*	*1*	*3*	*3*	*8*	*241CHEM-3*

Course Objectives; They are to identify the following

1. ***Types of conductors***
2. ***Classification of electrolytic cells***
3. ***Measuring EMF***
4. ***Applications of electrochemistry***

Syllabus: A-Theoretical contents

Electrolytic conductors, General electrochemistry concepts, Introduction to electrochemistry: electrode potentials, galvanic and electrolytic cells, Nernst equation, Corrosion and corrosion protection, Overview of applications of electrochemistry

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content

5. Pre-requirements for this course (if any):
241CHEM-3

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

This course aims to give students the basic principles of electrochemistry and its applications

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		

No	Mode of Instruction	Contact Hours	Percentage
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad understanding and critical view on principal of electrochemistry, Concepts and terminology of electrochemistry topics including; electrolyte solution theories, electrochemical (Galvanic) cell, origin of electrode potential theories, Faraday's law of electrolysis, ……etc (P)***	K(1.1)	***lecture / discussion Seminars /presentation***	Objective questions
1.2	***Describe correctly the different phenomena associated with electrochemistry i.e.; type of electrodes, cell presentation (notation), cell reactions, electromotive force (P)***	K(1.2)	***lecture / discussion / Seminars /Individual presentation***	Objective questions + Essay Questions
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	***Demonstrate an ability in critical thinking, numeracy, statistical, analytical reasoning, use graphs,***	S(2.1)	***lecture / discussion / Seminars***	Essay Questions + solve Problems

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	charts and to solving problems related to faraday's law and Nernst equation. (P)		***/Individual presentation***	
2.2	***Perform experiments in electrochemistry, record, analyze, interpret the scientific data, and write reports. (P)***	S(2.2)	***Lab work, group work***	Objective questions + Essay Questions
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. (P)***	S(2.3)	***lab demonstrations / hands-on student learning activities***	Objective questions + Essay Questions
3.0	Values, autonomy, and responsibility ; (Upon completion of the course, student will be able to)			
3.1	***Working as a group leader in cooperation with other colleagues. (P)***	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.	*Electrolytic and Non-electrolytic conductors*	*3*
2.	*Oxidation States & Redox Reactions*	*2*
3.	*Galvanic (electrochemical) Cells*	*3*
4.	*Cell Potential under Standard Conditions*	*3*
5.	*Gibbs Energy and Redox Reactions*	*2*
6.	*Cell Potential under Nonstandard Conditions and Nernst equation*	*3*
7.	*Batteries & fuel cell*	*2*
8.	*Corrosion*	*2*
9.	*Electrolytic cell*	*2*
10.	*Selected experiments related to the course topic*	*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***	***15***	***5 %***
5	***Safety Exam***	***11***	***4%***
6	***Final practical exam***	***11***	***7 %***
7	***Lab report***	***2-10***	***10 %***
8	***Group work evaluation***	***2-10***	***4%***
9	***Final Exam***	***12-14***	***50 %***
	Total		***Total***

*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	Handbook of Electrochemistry, 2007, Cynthia G. Zoski, Elsevier
Supportive References	• Electrochemistry, 2nd Edition, P.H. Rieger, Springer, 1993 ISBN: 0412043912,9780412043918 • Electrochemistry and Corrosion Science, Nestor Perez, 2016, Springer International Publishing, ISBN: 978-3-319-24845-5,978-3-319-24847-9
Electronic Materials	***Some course contents and materials are posted on Black board sites***
Other Learning Materials	• https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry • https://courses.lumenlearning.com/chemistryformajors/chapter/introduction-to-electrochemistry/ • https://pages.uoregon.edu/tgreenbo/electrolysis10.html https://pages.uoregon.edu/tgreenbo/voltaicCellEMF.html

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	***1 Lecture room(s) for groups of 50 students*** ***1 Lab room for group of 25student***
Technology equipment (projector, smart board, software)	***Smart board, Data show, Black board, Internet***

Items	Resources
Other equipment (depending on the nature of the specialty)	***Conductivity meter, metal electrodes (i.e. Fe, Cu, Al, Sn, Zn, Mg, Pb …), Voltameter, Power source, Balance, potentiostate, galvanostate……***

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 & indirect)***
Quality of learning resources	***Program coordinator***	***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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

1- LAB EXPERMENTS

Week	EXPERMENTAL TITLE	Chemicals and Apparatus used	Remarks
1	Safety and regulations		
1	Determination of cell constant	0.1N KCl, conductivity cell	
2	Determination of equivalent conductance	0.1N KCl, $MgSO_4$, monochloric acid, conductivity cell	None
3	Activity Series	0.1 M $Cu(NO_3)_2$, 0.1 M $Mg(NO_3)_2$, 0.1 M HCl, 0.1 M $Zn(NO_3)_2$, 0.1 M $AgNO_3$, Mg, Cu, Zn	None
4	Electrochemical Cells	0.5M $Cu(NO_3)_2$, 0.5M $Zn(NO_3)_2$, 0.5M $Pb(NO_3)_2$, 0.5M KNO_3 rods, DC voltmeter or digital multimeter, copper, zinc, lead.	None
5	Galvanic cell creating from environment	Citric acid, Oxalic acid., sheet of copper , sheet of zinc, distilled water, DC voltmeter or digital multimeter, Lemon, Kiwi,…….	None
6	Simple galvanic cell using pottery vase or any membrane partition	Zn, Pb, Cu, strips , 0.1M $CuSO_4$, 0.1 M $Zn(NO_3)_2$, 0.1 M $Pb(NO_3)_2$, 0.1 M $FeSO_4$ and 0.1 M KNO_3, DC voltmeter or digital multimeter, porous vase	None
7	Investigation of the temperature coefficient Of Galvanic Cell	Copper Sulfate ($CuSO_4$),Zinc Sulfate ($ZnSO_4$), sheet of copper ,sheet of zinc, voltmeter or digital multimeter, thermometer	None
8	Corrosion	Zn Sheets, NaOH, balance	None
9	An Electrolytic Cell: Electrolysis of $CuCl_2$	0.2 M $CuCl_2$. Power supply or 9V batteries	None
10	An Electrolytic Cell: Electroplating	1.0 M $CuSO_4$, a copper strip, iron nail, battery or power source,	None
11	Final exam		

For unavailable equipments, we use some stimulated experiments through links as:

https://pages.uoregon.edu/tgreenbo/voltaicCellEMF.html

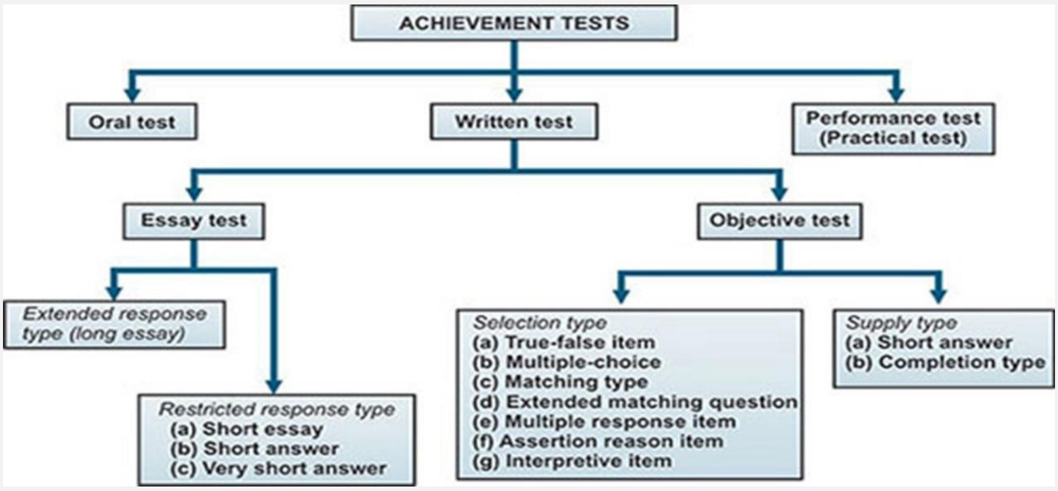
http://introchem.chem.okstate.edu/DCICLA/voltaicCell20.html

2- Blue Print

Course Name	ELECTROCHEMISTRY
Course Code	344 CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
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 (15M)	Quiz	Objective Q	2	2	1
			Mid term	Objective Q	6	6	3
			Final Exam	Objective Q	11	11	11
	K2	1.2 (21M)	Quiz	Essay q	2	2	1
			Mid term	Essay q	5	5	5
			Final Exam	Essay q	5	5	15
Skills	S1	2.1 (34M)	H.W	Solving Problems & chart analysis	4	4	2
			Quiz	Solving Problems & Essay Questions + solve Problems	1	1	1
			Mid term	Solving Problems & Essay Questions + solve Problems	2	2	7
			Final Exam	Solving Problems & Essay Questions + solve Problems	6	6	24
	S2	2.2 (22M)	Practical Sheet	Objective Q	6	6	3
				Essay q	2	2	2
			Lab Report	Lab report rubric	10	10	10
			Final Lab Exam	1Task experiment	1	1	7
	S3	2.3 (4M)	Safety Exam	Objective Q + Essay q	8	8	4
Value	V1	3.1 (4)	Continuous assessment	Group evaluation rubric	-	4	4
	TOTAL	100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Methods of Instrumental Analysis**
Course Code:	**415CHEM4**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**: Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**25 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☐ Elective☐	
3. Level/year at which this course is offered:	Level **10th** Year **4th**

4. Course general Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Methods of Instrumental Analysis	*415CHEM4*	*3*	*2*	*4*	*4*	*10*	*212CHEM3*

This course aims to give students the basic principles of methods of instrumental analysis and their applications

Course objectives: They are to identify the following.

- Recognizing the Electromagnetic Radiation.
- Recognizing the Molecular Ultraviolet and Visible Absorption Spectroscopy.
- Recognizing the Infra-Red Spectroscopy, Spectrum of IR and IR Instrumentation.
- Recognizing the Atomic and emission Spectrometry as well as NMR, MS and X-Ray Spectroscopy

Syllabus: A-Theoretical contents
Spectroscopic methods: Introduction to electromagnetic radiation and molecular transitions, UV- and visible radiations and spectrophotometer, Laws of spectral absorption, Fluorimetry, Infra-red spectrometer, atomic absorption and atomic emission spectrometers, NMR spectrometer, Mass spectrometry, X-ray absorption and fluorescence.

Syllabus: B-Practical contents

- Selected experiments related to instrumental analysis (See attachment)

5. Pre-requirements for this course (if any): *212 CHEM4*

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

7. Course Main Objective(s)

This course aims to give students the basic principles of methods of instrumental analysis and their applications

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	55

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 a broad understanding and knowledge in different topics of the course as, electromagnetic radiation, molecular transitions after absorption of light, electronic transitions, dual nature of light radiations and use of analytical instruments for qualitative and quantitative chemical analysis and in addition the necessary background in Physics and Mathematics.**	K(1.1)	***lecture / discussion Seminars /presentation***	***Objective questions***
1.2	**Describe correctly Chemical phenomena using instrumental**		***lecture / discussion /***	***Objective questions***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	analysis principles and scientific reasoning	K(1.2)	*Seminars /Individual presentation*	
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate an ability in critical thinking, analytical reasoning and solving problems concerning with instrumental analysis (in measurement and modeling of chemical systems)	S(2.1)	*lecture / discussion / Seminars /Individual presentation*	Solving Problems & chart analysis & Essay questions
2.2	Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments in the field of instrumental analysis and to write a report representing the scientific data.	S(2.2)	*Lab work, group work*	*Lab final exam / lab report rubric/ Objective questions*
2.3	Examine his material and lab safety background to Follow proper procedures and regulations for safe handling and use of chemicals.	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 in cooperation with other colleagues. (P)*	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.	Types of Instrumental Analysis Methods and Applications of Instrumental Methods of analysis and Advantage of instrumental analysis	3
2.	Electromagnetic field, Elementary theoretical basis of spectroscopy, Electronic Excitations, Electronic absorption	3

3.	Spectroscopy, UV-Vis spectroscopy, Absorption laws, Lambert-Beer Law, Instrumentation Sample Preparation Sample Cleanup	6
4.	Mass spectroscopy for qualitative and quantitative analysis and nuclear magnetic resonance for identification of the organic compounds (qualitative analysis)	3
5.	Infrared spectroscopy , IR-Radiation, Modes of Vibration, Typical Infrared Absorption Regions, Frequencies of common structural units, Sample Application, Measurement process , Infrared Absorption, Calibration and Background Spectrum, Advantages of IR analysis, Detection and Quantitation, FT-IR Qualitative and Quantitative	3
6.	Atomic spectroscopy, Atomic Absorption Spectroscopy (AAS), Atomic Emission Spectroscopy (AES), Steps of Atomic Absorption measurement, Vaporization and Atomization	6
7.	Atomic Emission Spectroscopy, Recording and Analysis, Inductively coupled plasma (ICP) and advantages of ICP	3
8.	X-Ray Analysis, What is X-Ray? , Generation of X-Rays, Sampling, Identifying and Quantization of Compounds	3
9.	Fluorescence Spectroscopy, What is Fluorescence Spectroscopy? Introduction to Fluorescence Spectroscopy, Sampling	3
10.	Selected experiments related to instrumental analysis	**22**
Total		55

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homework**	**3-8**	**2 %**
2.	**Quiz**	**4-6**	**3 %**
3.	**Midterm Exam**	**6-8**	**15 %**
4.	**LAB Sheet**	***10-11***	**5 %**
5.	**Quiz in Safety**	***10-11***	**4%**
6.	**Final practical exam**	***11***	**10 %**
7.	**Lab report**	***2-10***	**5%**
8.	**Group work evaluation**	***2-10***	**6 %**
9.	**Final Exam**	**12-14**	**50 %**
	Total		**100 %**

*As8.sessment 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	د. إبراهيم الزامل (التحليل الآلي) – دار الخريجي- الطبعة الثالثة 1998

	- Douglas A. Skoog, F James Holler and Stanley R. Crouch, Principles of instrumental analysis, (2016) 7th edition Thomson Brooks/Cole
Supportive References	د. سلامة أحمد خميس محمد (المطيافيات بين النظرية و التطبيق) جامعة المجمعة- الطبعة الأولى– (143)2010
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	Websites on the internet that are relevant to the topics of the course https://learnchemistry12.com/2018/02/modern-chemical-analysis-book.html https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Instrumental_Analysis https://chem.libretexts.org/Courses

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	***1 Lecture room(s) for groups of 50 students*** 1 Lab room for 25 students
Technology equipment (projector, smart board, software)	***Smart board, Data show, Black board, internet***
Other equipment (depending on the nature of the specialty)	**none**

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***	***Classroom evaluation (direct & indirect)***
Quality of learning resources	***Program coordinator***	***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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

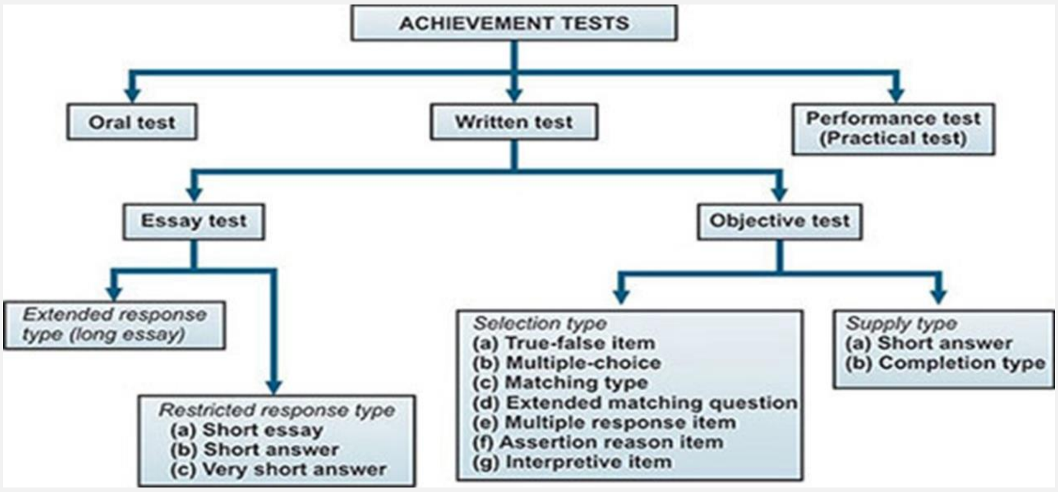
No	Title of Experiment	Tools, Chemicals, and equipment Needed in Experiments	Week no.
1.	Safety measures	-	1
2.	Introduction to spectroscopic analysis and related calculations	-	2
3.	Determination of chromium chloride (colored compound) concentration using UV-Vis. Spectrophotometer	Conical flasks, chromium chloride, distilled water UV-Vis. Spectrophotometer	3
4.	Determination of potassium nitrate (colorless compound) concentration using UV-Vis. Spectrophotometer	Conical flasks, potassium nitrate, distilled water UV-Vis. Spectrophotometer	4
5.	Spectrophotometric determination of paracetamol in tablets	Conical flasks, paracetamol bulk powder, Panadol tablets, distilled water, methanol, UV-Vis. Spectrophotometer	5
6.	Spectrophotometric determination of paracetamol in tablets	Conical flasks, paracetamol bulk powder, Panadol tablets, distilled water, methanol, UV-Vis. Spectrophotometer	6
7.	Spectrofluorimetric determination of eosin yellow dye	Conical flasks, eosin yellow dye, distilled water Spectrofluorimeter	7
8.	IR- identification of benzoic acid	Benzoic acid, potassium bromide, acetone, IR- spectrometer	8
9.	Determination of metals concentration using atomic absorption spectrometer	Nickel standard solutions, water samples containing nickel, nitric acid, distilled water, atomic absorption spectrometer	9
10.	Determination of metals concentration using flame spectrometer	Nickel standard solutions, water samples containing nickel, nitric acid, distilled water , flame spectrometer	10
11.	Final exam	-	11

2- Blue Print

Course Name	Methods of instrumental analysis
Course Code	415CHEM4

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	--
Marks	10	18	42	20	4	---	6	--

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (10M)	Quiz	Objective questions	2	1	1
			Mid term	Objective questions	3	2	2
			Final Exam	Objective questions	3	7	7
	K2	1.2 (18M)	Quiz	Objective questions	2	1	1
			Mid term	Objective questions	4	5	5
			Final Exam	Objective questions	6	12	12
Skills	S1	2.1 (42M)	H.W	Solving Problems & chart analysis & Essay questions	4	2	2
			Quiz	Solving Problems & chart analysis & Essay questions	2	1	1
			Mid term	Solving Problems & chart analysis & Essay questions	6	8	8
			Final Exam	Solving Problems & chart analysis & Essay questions	12	31	31
	S2	2.2 (20M)	Practical Sheet	Objective questions	2	8	5
			Lab Report	Lab report rubric	5	5	5
			Final Lab Exam	I Task experiment	1	7	10
	S3	2.3 (4M)	Safety Quiz	Objective questions	1	8	4
Value	V1	3.1 (6M)	Continuous assessment	Group evaluation rubric	-	6	6
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **Lanthanides & Actinides**	
Course Code: **424CHEM3**	
Program: **Bachelor in Chemistry**	
Department: **Chemistry**	
College: **College of Science**	
Institution: **Jazan University (JU)**	
Version: **T104 2022**	
Last Revision Date: **1 January 2023**	

Table of Contents:

A. General information about the course:

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 12* *Year 4*
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Lanthanides & Actinides	*424CHEM3*	*2*	*1*	*3*	*4*	*10*	*322CHEM4*

This course aims to give the students some information about the nuclear fission and fusion, how to measure the doses of radiation, recognizing the effect of radiation and the methods of protection and giving an idea about the elements of lanthanides and actinides

Course objectives: They are to identify the following.

1. Recognizing the concept of nuclear fission and fusion.
2. Recognizing the method of measuring of low and high radiation doses.
3. Recognizing the effect of radiation on biological systems and the ways of protection.
4. Recognizing the lanthanides and actinides elements.
5. Recognizing the electronic structures, chemical and physical properties, and the reactions of those elements

a) **Syllabus: A-Theoretical contents**

b) ***The scientific content of the theoretical part*:**

1) Nuclear and Radiochemistry: The nature of nuclear and radiochemistry and the sources of ionizing radiation – Radiation decay and standard units – Radiation interaction with matter – Theories related to the structure of nucleus – Nuclear fission and fusion and emitted energy – Measurement of low and high radiation doses – The effect of radiation on biological systems and the ways of protection.
2) Lanthanides Group: Comparative study between lanthanides and transition elements – Comparative study between lanthanides and alkaline earth metals – The electronic structure of the elements – Different oxidation states – The physical properties such as magnetic, spectral and color properties – Electronic shield – Methods of separation: Fractional crystallization, ion exchange, etc.
3) Actinides Group: electronic structure – Methods of preparation – Radiation decay – Element enrichment.

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content.

5. Pre-requirements for this course (if any): ***322CHEM***
6. Co- requirements for this course (if any): ***None***
7. Course Main Objective(s) ***This course aims to give the students some information about the nuclear fission and fusion, how to measure the doses of radiation, recognizing the effect of radiation and the methods of protection and giving an idea about the elements of lanthanides and actinides***

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 on the properties, occurrence, separation and uses of lanthanides and actinides*	K(1.1)	***lecture / discussion Seminars /presentation***	***Objective question***
1.2	*Describe the radioactivity of unstable isotopes, fission and*	K(1.2)	***lecture / discussion /***	Essay question

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	fusion reactions and their applications. (M)		***Seminars /Individual presentation***	
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	*Demonstrate the knowledge and skills required to solve problems in the nuclear equation, radioactivity half-life, decay series, fission and fusion*.	S(2.1)	***lecture / discussion / Seminars /Individual presentation***	Solving Problems
2.2	Practice the experimental skills and to write a report in laboratory representing the obtained results. *(M)*	S(2.2)	***Lab work, group work***	***Objective question, Essay question,*** ***lab report rubric***
2.3	Follow proper procedures and regulations for safe handling and use of chemicals.	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 group leader and as a member of a team in Lab. (M)*	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.	Introduction Electronic structure, oxidation states, abundance, extraction and uses of lanthanides.	***2***
2.	Separation of the lanthanide elements.	***2***

3.	Chemical properties of (+iii), (+iv) and (+ii) lanthanides compounds.	2
4.	Colour and spectra of lanthanides.	1
5.	Magnetic properties, lanthanide contraction and complexes.	2
6.	Electronic structure, oxidation states and occurrence of actinides.	2
7.	Preparation of actinides.	1
8.	General properties of actinides.	1
9.	Occurrence, extraction and chemical properties of thorium and uranium.	2
10.	Structure, forces and stability of the nucleus.	1
11.	Modes of decay, half-life period, binding energy and nuclear stability	2
12.	Nuclear fission, nuclear power stations, moderators and types of reactors.	2
13.	Nuclear fusion and some applications of radioactive isotopes.	2
14.	Selected Experiments related to course topics.	22
Total		44

D. Students Assessment Activities

No	Assessment Activities *		Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Homework assignment***		**2-6**	**2 %**
2.	***Lecture Quizzes***		**4-6**	**3 %**
3.	***Mid-term exam***		**6-8**	**15 %**
4.	***Practical work***	***LAB Sheet***	**10**	**5 %**
5.		***Quiz in Safety***	**10-11**	**4%**
6.		***Final practical exam***	**11**	**7 %**
7.		***Lab report***	**2-10**	**8 %**
8.		***Group work evaluation***	**2-10**	**6%**
9.	***Final Exam***		**12-14**	**50 %**
	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	1. Lee, J. D. (2009) Concise Inorganic Chemistry, 5 th Edition Authorized Reprint Published by Blackwell Science Limited, France. 2. F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus. Basic Inorganic Chemistry, 3rd Edition ISBN: 978-0-471-50532-7 January 1995,
Supportive References	1. Simon A. Cotton, (2013) Lanthanide and Actinide Chemistry, Macmillan Education, 204p.

	2. Walter D. Loveland, David J. Morrissey, Glenn T. Seaborg (2017) Modern Nuclear Chemistry, John Wiley & Sons.
Electronic Materials	• https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry • https://www.britannica.com/science/lanthanum https://byjus.com/jee/f-block-elements/
Other Learning Materials	• https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Book%3A_Introductory_Chemistry_(CK-12)/06%3A_The_Periodic_Table/6.14%3A_Lanthanides_and_Actinides https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=Lanhanides+and+actinides&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

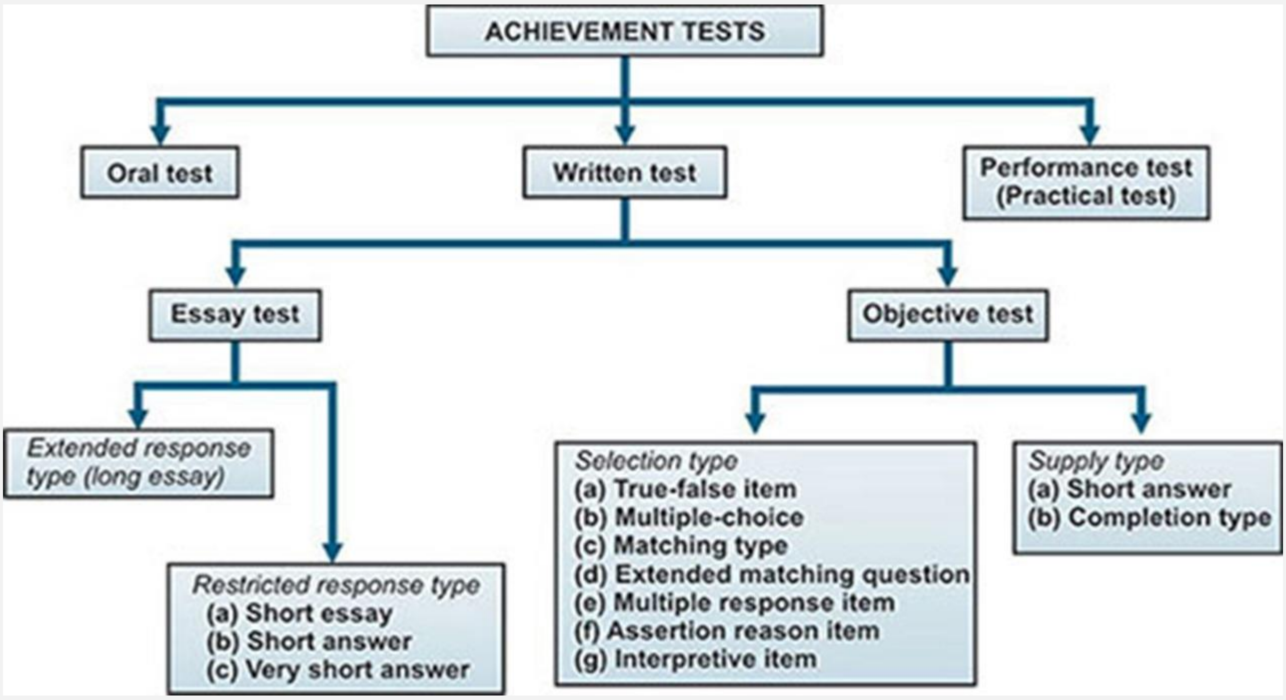
#	EXPERMENTS	Equipment, Chemicals and Tools.	No of weeks for each experiment
1	Introduction and lab safety		One week
2	The Structure of Atoms	Theoretical calculation	One weeks
3	Chemical Periodicity	Theoretical calculation	One weeks
4	Chemical Bonding	Theoretical calculation	Two weeks
5	Exam	Theoretical calculation	One week
6	Molecular Structure and Covalent Bonding Theories	Theoretical calculation	Two weeks
7	Coordination Compounds	Theoretical calculation	Two weeks
8	Revision		One week
9	Final Exam		One week

2- Blue Print

Course Name	Lanthanides & Actinides
Course Code	424CHEM -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	**1.1**	**1.2**	**2.1**	**2.2**	**2.3**	**2.4**	**3.1**	**3.2**
Marks	**10**	**18**	**42**	**20**	**4**	**--**	**6**	**--**

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	**1.1** **(10 M)**	Quiz	Objective Q	**2**	**2**	**1**
			Mid term	Objective Q	**8**	**4**	**2**
			Final Exam	Objective Q	**14**	**7**	**7**
	K2	**1.2** **(18 M)**	Quiz	Essay Q	**2**	**2**	**1**
			Mid term	Essay Q	**4**	**4**	**4**
			Final Exam	Essay Q	**7**	**13**	**13**
Skills	S1	**2.1** **(42 M)**	H.W	Solving Problems and Essay Q	**2**	**2**	**2**
			Quiz	Solving Problems and Essay Q	**2**	**2**	**1**
			Mid term	Solving Problems and Essay Q	**2** **3**	**3** **6**	**9**
			Final Exam	Solving Problems and Essay Q	**4** **6**	**12** **18**	**30**
	S2	**2.2** **(20 M)**	Practical Sheet	Objective Q	**2**	**2**	**2**
				Essay Q	**3**	**3**	**3**
			Lab Report	Lab Rubric	**5**	**5**	**8**
			Final Lab Exam	I Task experiment	**7**	**7**	**7**
	S3	**2.3** **(4 M)**	Safety Exam	Objective Q	**8**	**4**	**4**
Value	V1	**3.1** **(6 M)**	Continuous assessment	Group evaluation rubric	**1**	**6**	**6**
TOTAL		**100**					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Group Theory**
Course Code:	***425CHEM-2***
Program:	***Bachelor in Chemistry***
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**29 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered: Level 12 / Year 4	

1. Course Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Group theory	425CHEM-2	2	0	2	4	12	322CHEM4

Course objectives: They are to identify the following.

1- Recognizing the elements of symmetry and point groups.
2- Recognizing the reducible and irreducible representations.
3- Recognizing the vibrational spectroscopy.
4- Recognizing the infrared absorption bands and Raman lines.

Syllabus: A-Theoretical contents

Elements of symmetry and point groups – Reducible and irreducible representations – Character tables – Vibrational spectroscopy – Infrared absorption bands and Raman lines – Bonding in transition elements complexes – Spectra of octahedral, tetrahedral and square planar complexes.

Syllabus: B-Practical contents

Non

5. Pre-requirements for this course (if any): *322CHEM-4*

6. Co- requirements for this course (if any): *Non*

7. Course Main Objective(s)

The course of Group theory designed to give the students some information about the principles of symmetry and group theory, laws, and their applications in chemistry.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad, knowledge in the symmetry element and recognize symmetry operations, resonance, molecular vibrations. (M)	K (1.1)	Lecture group work discussion	Objective Q
1.2	Describe the essential facts, principles and theories in group theory and its application in chemistry. (M)	K(1.2)	Lecture group work discussion	Short answer Questions
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills in the aspects of group theory,	S(2.1)	lecture group work discussion	Solving Problems

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	to analyze the obtained from symmetry. (M)			
2.2	Make effective use of communication, and online technology about chemistry topics in order to improve their basic knowledge in writing (report and paper/ poster) with a good verbal and clear scientific language. (M)	S((2.4)	project-based learning Technology-enabled learning	Research presentation rubric
2.3				
2.4				
3.0	Values, autonomy, and responsibility ; (Upon completion of the course, student will be able to)			
3.1	***Act with integrity and good ethics in chemistry profession and their obligation to society*** (M)	V(3.2)	Research activities	Ethic check rubric
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	Symmetry Elements and Operations	***5***
2.	Point Groups - Groups of Low and High Symmetry Other Groups	***5***
3.	Properties and Representations of Groups - Matrices - Representations of Point Groups Character Tables	***3***
4.	Examples and Applications of Symmetry - Polarity & Chirality Molecular Vibrations	***3***
5.	Resonance spectrum and reduced spectrum. - Infra-red spectroscopy Raman spectroscopy	***3***
6.	Octahedral, tetrahedral and square planer complexes	***3***

Total	22

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***HW***	***4-9***	***5***
2.	***Mid-term Exams***	***5-10***	***25***
3.	***Presentation Session***	***11***	***6***
4	***Ethic check***	***11***	***4***
5	***Final EXAM***	***12-13***	***60***
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	Inorganic Chemistry, 5th Edition by Gary L. Miessler, Paul J. Fischer, Donald A. Tarr, (2013)
Supportive References	Molecular Symmetry and Group Theory: A Programmed Introduction to Chemical Applications, 2nd Edition by Alan Vincent (2001)
Electronic Materials	***Some course contents and materials are posted on Black board sites***
Other Learning Materials	• http://symmetry.otterbein.edu/gallery/index.html • 3D sym op android program

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

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 & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

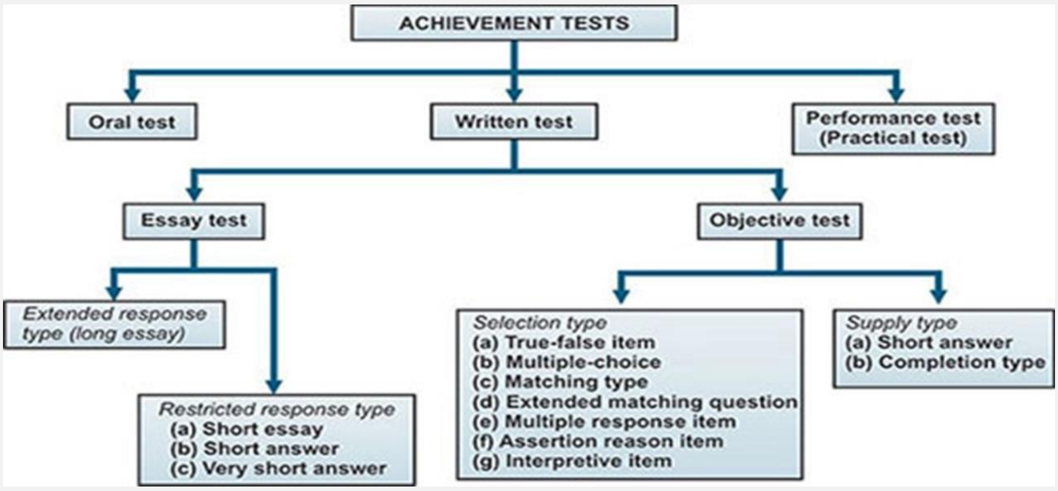
1- Practical Work

2- Blue Print

Course Name	Group Theory
Course Code	425CHEM-2

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1			2.2		3.1
Marks	10	20	60	---	---	6	---	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 (10M)	HW	Objective Q	2	2	1
			Mid-term	Objective Q	4	2	2
			Final Exam	Objective Q	14	7	7
	K2	1.2 (20M)	HW	Short answer Questions	1	1	1
			Mid-term	Short answer Questions	6	6	6
			Final Exam	Short answer Questions	7	13	13
Skills	S1	2.1 (60M)	HW	Solving Problems & chart analysis	3	3	3
			Mid-term	Solving Problems & chart analysis	7	17	17
			Final Exam	Solving Problems & chart analysis	8	40	40
	S4	2.2 (6M)	Research presentation	Research rubric	-	-	2
				PPT design	-	-	2
				Oral discussion	-	-	2
Value	V2	3.1 (4)	Research ethic check	ethic check rubric	-	4	4
	TOTAL	100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**CHEMISTRY OF NATURAL PRODUCTS**
Course Code:	**436CHEM2**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**25 December 2022**

Table of Contents:

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A. General information about the course:

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 10 Year 4

4. Course general Description

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre- requisite
		Lec.	Prac.				
Chemistry of Natural Products	436CHEM2	2	1	3	4	12	232CHEM3

Course objectives: They are to identify the following.

- Main classes of natural products and their types.
- Terpenoid; importance, classification, extraction, isolation, and structure elucidation.
- Alkaloids; importance, classification, extraction, isolation, and structure elucidation.
- Natural phenolic compounds; classification, extraction, isolation, and structure elucidation.

Syllabus: A-Theoretical contents

- Definition and classification of different classes of natural products and their isolation by different chromatographic methods- Structure elucidation by means of physical and chemical methods. Some chemical reactions and biosynthesis of terpenes, steroids, alkaloids and natural phenolic (flavonoids, xanthones, anthraquinons and coumarins

Syllabus: A-Practical contents

- Preparation and identification of some organic compounds, (such as aspirin - Benzoyl Glycine – benzamide - phthalimide - picric acid - P- nitro-acetanilide, etc.)

5. Pre-requirements for this course (if any): 232CHEM3

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

7. Course Main Objective(s)

This course aims to provide students with the basic knowledge about the main classes of natural products, means of extraction, isolation, structure characterization, and their most important uses

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge and understanding of the principles of natural product chemistry, concepts and terminology related to secondary metabolites including the different classes of them such as terpenes, alkaloids, phenols, steroids…. etc. (M)	K(1.1)	Lectures, directed reading, group discussion and assignments	Objective question
1.2	Know the different strategies for extraction and isolation of secondary metabolites from their sources and outline the importance and uses of these compounds. (M)	K(1.2)	Lectures, directed reading, group discussion and assignments	Objective question, Essay question
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	Demonstrate knowledge and ability to think critically to distinguish and compare between different types of	S(2.1)	Lectures, directed	Objective question, Essay

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	secondary metabolites and how to isolate and elucidate the structure of these compounds by the different methods. (P)		reading, group discussion and assignments	question, Solving Problems
2.2	Conducting experiments to isolate secondary metabolites from their sources and identify them as well as synthesis important organic compounds in lab, analyze results and write a scientific report about them. (M)	S(2.2)	Lab work, group work	Objective question, Essay question, lab report rubric
2.3	Know and follow appropriate procedures and regulations for the safe handling, use and disposal of chemicals. (P)	S(2.3)	Lab work	MCQ Safety exam
3.0	Values, autonomy, and responsibility; (Upon completion of the course, student will be able to)			
3.1	Work as a group leader in cooperation with other colleagues. (P)	V(3.1)	Group work	Practical group work Rubric

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to natural products, classification, extractions, isolation, and structure elucidation	3
2.	Terpenoid; importance, classification, extraction, isolation, and structure elucidation.	7
3.	Alkaloids; importance, classification, extraction, isolation, and structure elucidation.	4
4.	Natural phenolic compounds; classification, extraction, isolation, and structure elucidation.	5
5.	Miscellaneous natural products	3
6.	Selected experiments on preparation, isolation, and purification of simple organic compounds	22
Total		44

D. Students Assessment Activities

No	Assessment Activities *		Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homework assignment**		**3-10**	**3%**
2.	**Quiz**		**4**	**2%**
3.	**Mid-term exam**		**7**	**15%**
4.	**Lab**	**Safety EXAM**	**5**	**4%**
		Lab reports	**2-10**	**5%**
		Final sheet exam	**11**	**6%**
		Final practical exam	**11**	**10%**
		Group work evaluation	**2-10**	**5%**
5.	**Final Exam**		**12-14**	***50 %***
	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	-كيمياء المنتجات الطبيعية – الجزء النظري, أ.د. طاهر حسن, جامعة البعث, مديرية الكتب المطبوعات الجامعية -المنتجات الطبيعية، د. حسن بن محمد الحازمي، جامعة الملك سعود-عمادة شؤون المكتبات، 1995
Supportive References	- Chemistry of Natural Products, S.V. Bhat, B.A. Nagasampagi, S. Minakshi, Springer, 2005 - Chemistry of Natural Products, Ayodhya Singh, Campus Books International, 2004 - Natural Products Isolation, S. D. Saker, Z. Latif, A. I. Gray, 2nd ed., Humana Press, Totowa, New Jersey, 2006.
Electronic Materials	https://chem.libretexts.org https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book
Other Learning Materials	• www.wikipedia.org • https://www.slideshare.net/ShvetaArya/chemistry-of-naturalproducts

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students

Items	Resources
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

	Experiment	Equipment, Chemicals and Tools	Week Due	Remarks
1	Lab Safety		1	The required equipment and tools for teaching the practical part are: - UV/Vis Spectrophotometer - IR spectrophotometer - NMR spectrometer - Hotplate magnetic stirrer - Condensers - Separating funnels different sizes - Rotary evaporator - Melting point apparatus - Heating mantle - TLC sheets - Capillary tubes
2	Preparation of Aspirin	Salicylic acid, acetic anhydride	2	
3	Preparation of acetanilide	Aniline acetic anhydride	3	
4	Preparation of Phthalimide	Phthalic anhydride and Urea	4	
5	Preparation of Phthalyl glycine	Phthalic anhydride and Glycine	5	
6	Preparation of benzoin	Benzaldehyde and Potassium cyanide	6	
7	Preparation of benzophenone Oxime	Benzophenone and hydroxylamine hydrochloride	7	
8	Preparation of 7-hydroxycoumarine	Resorcinol, ethyl acetoacetate, and sulphuric acid	8	
9	Extraction of caffeine from green tea	Green tea, chloroform, and separating funnel	9	
10	IR spectra of selected prepared compounds	Infra-Red Spectroscopy apparatus	10	
11	Final sheet and practical exam		11	

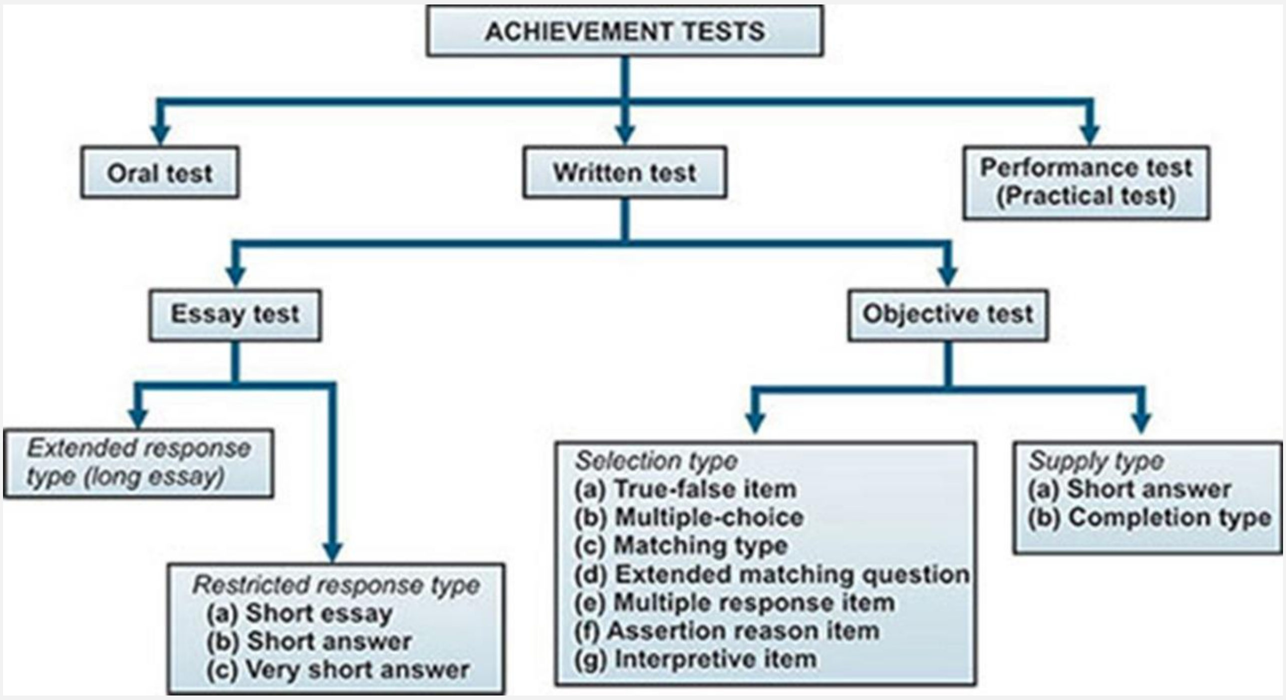
Instructors select experiments according to availability of chemicals and tools

2- Blue Print

Course Name	Chemistry of Natural Products
Course Code	436CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	12	20	38	21	4	--	5	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (12 M)	Quiz	Objective question	1	0.5	0.5
			Mid term		1(2)	3.5	3.5
			Final Exam		1(4)	8	8
	K2	1.2 (20 M)	Quiz	Objective question, Essay question,	1	0.5	0.5
			Mid term		1(5)	5.5	5.5
			Final Exam		1(7)	14	14
Skills	S1	2.1 (38 M)	HW	Objective question, Essay question, Solving Problems,	3(5)	3	3
			Quiz		1(2)	1	1
			Mid term		1(3)	6	6
			Final Exam		1(7)	28	28
	S2	2.2 (21 M)	Lab Report	Lab report rubric	10	5	5
			Final sheet exam	Objective question, Essay question,	3	6	6
			Final practical exam	I Task experiment	1	10	10
	S3	2.3 (4 M)	Safety Quiz	MCQ Safety exam	8	4	4
Value	V1	3.1 (5 M)	Continuous assessment	Group work evaluation rubric		5	5
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	STEREOCHEMISTRY
Course Code:	437CHEM2
Program:	Bachelor in Chemistry
Department:	Chemistry
College:	College of Science
Institution:	Jazan University (JU)
Version:	T104 2022
Last Revision Date:	31 December 2022

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	2h
2. Course type	
a.	University ☐ College ☐ Department☒ Track☐ Others☐
b.	Required ☒ Elective☐
3. Level/year at which this course is offered: Level 8 / Year 3	
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Stereochemistry	*437CHEM2*	*2*	*0*	*2*	*3*	*8*	*232CHEM3*

This course aims to give students basic principles of stereo models, projections, symmetry and dynamic and static stereochemistry.

Course objectives: They are to identify the following.

- ***To identify the dynamic and static stereochemistry concepts.***
- ***To identify different shapes of organic compounds and nomenclature of chiral compounds.***
- ***To distinguish between chiral and achiral compounds.***
- ***To identify of the spatial models, sequences rules and priority.***
- ***To identify some organic reactions (addition, elimination, and rearrangement) and their stereochemistry.***

Syllabus: A-Theoretical contents

General introduction of stereochemistry – isomerism- conformation - spatial models - sequence rules - Cis- and Trans- stereoisomerism - chirality and prochirality - optical activity – Enantiomers and diastereomers - meso compound - Dynamic Stereochemistry including, addition, elimination and rearrangement reactions.

Syllabus: A-Practical contents

none

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

232CHEM3

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

none

7. Course Main Objective(s)

This course aims to give students the basic principles of photochemistry and its chemical and biological applications

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad, knowledge and understanding in the basic information of stereochemistry, the distinguish between static and dynamic stereochemistry, enantiomers and diastereomers. (M)	K (1.1)	Lecture group work discussion	Objective Q
1.2	Describe the essential facts, principles and theories across the identification of the absolute configuration of chiral compounds using Cahn -Ingold _Prelong system, and Fischer Projections. (M)	K(1.2)	Lecture group work discussion	Short answer Questions
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills required to solve problems about the	S(2.1)	lecture	Solving Problems &

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	specific rotation of optically active compounds, enantiomeric excess of both enantiomers, and modeling of chemical systems. (P)		group work discussion	chart analysis
2.2	Make effective use of communication, and online technology about chemistry topics in order to improve their basic knowledge in writing (report and paper/ poster) with a good verbal and clear scientific language about stereochemistry. (I)	S((2.4)	project-based learning Technology-enabled learning	Research presentatio n rubric
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	Act with integrity and good ethics in chemistry profession and their obligation to society (M)	V(3.2)	Research activities	Ethic check rubric

C. Course Content

No	List of Topics	Contact Hours
1.	Chapter 1: Conformations of Alkanes and Cycloalkanes: Conformations of Alkanes and Cycloalkanes: Constitutional Isomers of Alkanes. Drawing Newman Projections. Conformational Analysis of Ethane and Propane Conformational Analysis of Butane Stability of Cycloalkanes.	*3*
2.	Conformations of Cyclohexane Drawing Chair Conformations Monosubstituted Cyclohexane cis-trans Stereoisomerism Chapter 2: Stereoisomerism: Introduction to Stereoisomerism. Designating Configuration Using the Cahn-Ingold-Prelog System.	*3*
3	Designating Configuration Using the Cahn-Ingold-Prelog System. Optical Activity. Stereoisomeric Relationships: Enantiomers and Diastereomers.	*3*
4	Chapter 3: Elimination Reactions: Introduction to Elimination Reaction-Stereoisomerism in Alkenes. Possible Mechanisms for Elimination; E1, E2 mechanism Drawing the Products of an E2 Reaction. Regioselective and Stereoselective of E2 Reactions.	*3*
5	The E1 Mechanism Drawing the Complete Mechanism of an E1 Process and rearrangement of carbocations.	*3*
6	Chapter 3: Addition Reactions	*3*

	Introduction to Addition Reactions, Hydrohalogenation -Acid-Catalyzed Hydration.	
7	Acid-Catalyzed Hydration. Halogenation- General Revisions.	***3***
8	Presentation Session	***1***
Total		22

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HW	7-8	5
2.	Mid-term Exam	5-8	25
3.	Presentation Session	11	6
4.	Ethic check	11	4
5.	Final EXAM	12-13	60
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	**Organic Chemistry, David R. Klein (Johns Hopkins University), John Wiley & Sons, Inc., 2010.**
Supportive References	**. Stereochemistry, R K Sharma, Discovery Publishing House, 2007.** **. Organic Stereochemistry, Robinson, Oxford University Press N Delhi, 2005.** **. Organic Chemistry, T.W. Graham Solomons and Craig B. Fryhle.** **. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes.**
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	• *https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=steriochemistry&type=wiki*

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet

Items	Resources
Other equipment (depending on the nature of the specialty)	none

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 & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

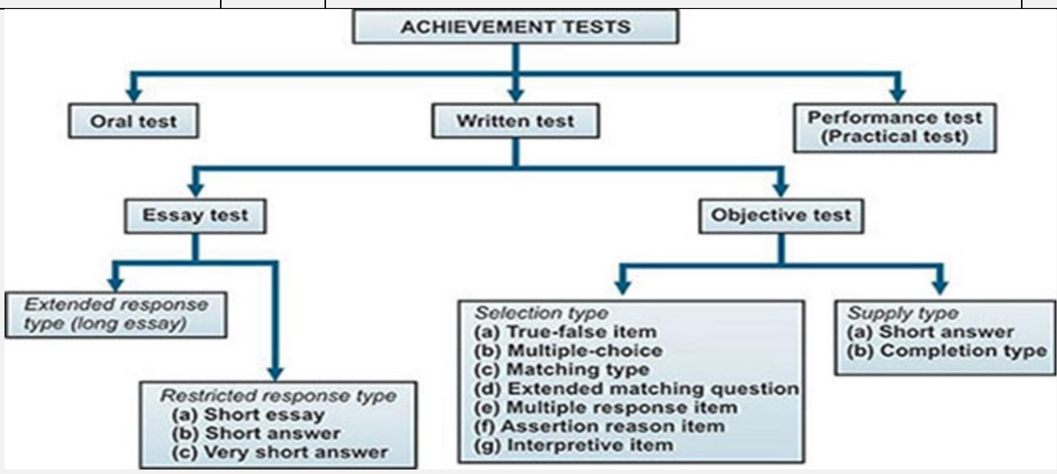
None

2- Blue Print

Course Name	STEREOCHEMISTRY
Course Code	437 CHEM2

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1			2.2		3.1
Marks	12	23	55	-	-	6	-	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 (12M)	HW	Objective Q	4	2	2
			Mid-term	Objective Q	4	2	2
			Final Exam	Objective Q	8	8	8
	K2	1.2 (23M)	HW	Short answer Questions	2	2	2
			Mid-term	Short answer Questions	3	6	6
			Final Exam	Short answer Questions	3	15	15
Skills	S1	2.1 (55M)	HW	Solving Problems & chart analysis	1	1	1
			Mid-term	Solving Problems & chart analysis	4	17	17
			Final Exam	Solving Problems & chart analysis	4	37	37
	S4	2.2 (4M)	Research presentation	Research rubric	-	2	2
				PPT design	-	2	2
				Oral discussion	-	2	2
Value	V2	3.1 (6)	Research ethic check	ethic check rubric	-	4	4
	TOTAL	100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	Applied Organic Chemistry
Course Code:	438 CHEM3
Program:	Bachelor in Chemistry
Department:	*Chemistry*
College:	College of Science
Institution:	Jazan University (JU)
Version:	T104 2022
Last Revision Date:	25 December 2022

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A. General information about the course:

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 12* *Year 4*
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre- requisite*
		Lec.	*Prac.*				
Applied Organic Chemistry	CHEM 438	2	2	3	4	12	232 CHEM3

The main purpose of Applied organic chemistry course is giving the students basic information about the petroleum, Petrochemicals, Polymers, and Dyes with their classifications, applications and their uses.

Course objectives: They are to identify the following.

- ***Discuss the occurrence, extraction, properties of petroleum and application of fractional distillation, catalytic cracking and catalytic reforming during petroleum processing.***
- ***Describe using equations and flow diagrams, the manufacture of some petrochemicals, namely, ethylene, propylene, synthetic gas, benzene and inorganic petrochemicals.***
- ***identify polymers, their physical properties and different kinds of addition polymerization***
- ***Identify the characteristics of some common polymers and the industrial importance of polymers and their uses in various fields.***
- ***Identify the types of pigments and paints.***
- ***Discuss the classification, synthesis and uses of dyes.***

Syllabus: A-Theoretical contents

The course is designed to give the students an idea about the polymer science – definition, classification of polymers, and polymerization by addition (chain reaction) – ionic polymerization (anionic and cationic) – free radical polymerization –polymerization by condensation– (linear polymerization– cross section polymerization). Introduce an idea about petroleum, Petrochemicals and industrial applications of organic chemistry, such as organic polymers and their uses in various fields and the manufacture of dyes and paints.

Syllabus: B-Practical contents

Basic knowledge concerning general Safety Rules, Lab Equipment, Purification of Organic Compounds, synthesis of some polymers, soap, cream, some dyes and examine their properties and their applications.

5. Pre-requirements for this course (if any): ***232CHEM3***

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

7. Course Main Objective(s)

The main purpose of Applied organic chemistry course is giving the students basic information about the petroleum, Petrochemicals, Polymers, and Dyes with their classifications, applications and their uses.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge and understanding of industrial chemistry, petroleum, petrochemicals, polymer, and dyes.* (P)	K (1.1)	***lecture/ discussion Seminars/presentation***	***Objective question***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	*Describe the uses and applications of petrochemicals, polymers, and dyes in our life.* (P)	K (1.2)	***lecture / discussion / Seminars /Individual presentation***	***Essay question***
2.0	Skills; (Upon completion of the course, student will be able to)			
2.1	*Demonstrate ability in critical thinking, analyzing reaction mechanisms and classifying industrial compounds*. (P)	S (2.1)	***lecture / discussion / Seminars /Individual presentation***	***Solving Problems & Essay question***
2.2	*Apply their experimental basics and skills to use laboratory equipment, modern instructions, and classical techniques for carrying out experiments in polymers, dyes and petroleum and write a report representing the scientific data*. (P)	S (2.2)	***Lab work, group work***	***Objective question, Essay question,*** ***lab report rubric***
2.3	*Examine and follow proper procedures and regulations for safe handling, use, and disposal of chemicals*. (P)	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 in cooperation with other colleagues*. (P)	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.	**Definitions, origin, and composition of crude oil.**	2
2.	**Characterization and classification of crude oil.**	2
3.	**Basic petroleum refining.**	2
4.	**Petrochemicals, classifications, uses and applications.**	2
5.	**Definition, Properties, and classifications of Polymers.**	2
6.	**Addition Polymerization.**	2
7.	**Condensation Polymerization.**	2
8.	**Application of industrial polymers.**	2
9.	**Introduction and Classifications of Dyes.**	2
10.	**Preparation, uses, and applications of dyes.**	2
11.	**Paints, types, constitutions and applications.**	2

12.	***selected experiments covered the course topics, Polymer synthesis, synthesis of some dyes, Soap manufacture...etc.*.**	**22**
Total		44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Homework assignment***	***3-10***	***4%***
2.	***Lecture Quizzes***	***4***	***1%***
3.	***Mid-term exam***	***6-8***	***15%***
4.	***LAB Sheet***	***10***	***5%***
5.	***Quiz in Safety***	***11***	***4%***
6.	***Final practical exam***	***11***	***6%***
7.	***Lab report***	***2-10***	***10%***
8.	***Group work evaluation***	***2-10***	***5%***
9.	***Final Exam***	***12-13***	***50%***
	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	**Industrial Organic Chemicals by Harold A. Wittcoff, Bryan G. Reuben and Jeffery S. Plotkin, 2012 | ISBN: 0470537434**
Supportive References	كتاب الصناعات البترولية والبتروكيماوية ... تأليف أ. د سالم بن سليم الذياب كيمياء و تقنية البوليمرات بواسطة أ. د. سالم سليم الذياب
Electronic Materials	• https://en.wikipedia.org/wiki/Chemical_industry • http://www.rsc.org/learn-chemistry • https://www.khanacademy.org/science/organic-chemistry • https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.htm • https://chem.libretexts.org/
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• 1 Lecture room(s) for groups of 50 students • 1 Laboratory for a group of 25 student

Items	Resources
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	Bunsen burner, reagent bottles, beakers, Buchner funnel, Test tube and many more. Scientific videos

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of student's assessment	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

While specific laboratory experiments vary depending on the instructor and the semester, the following list is representative of the experiments that are used:

Week	EXP, titles	Chemicals and tools	Remarks
1	**Phenol formaldehyde resin**	Glacial acetic acid, 40% formaldehyde solution, Phenol, conc. HCl. Glass rod, beakers, funnel, heater and filter paper, analytical balance, FTIR.	None
2	**Urea- Formaldehyde Resins**	Urea, Formaldehyde, 35-40 % neutral solution, Oxalic acid, saturated solution. Concentrated ammonia solution Conc. HCl. Flame, Beakers, Test Tubes, Filter papers, Funnels, filtration system, analytical balance	None
3	**Determination of Saponification Value**	Fat, Oil, Fatty acids, Standard N/2 HCl, Alc. KOH and phenolphthalein. Round bottom flask, burette, pipette, water condenser, water bath, analytical balance.	None
4	**DETERMINATION OF PURITY ANILINE SALTS**	Aniline hydrochloride, Aniline sulfate, Standard 0.1N HCl, and phenolphthalein. burette, pipette, conical flasks and dropper, analytical balance	None
5	**Determination of the Equivalent Weight of a Carboxylic Acid**	*Barium hydroxide solution 0.05N, phenolphthalein, carboxylic acids* Burette, pipette, conical flasks and dropper, analytical balance	None
6	**Preparation of para-Red and Dyeing**	4-Nitroaniline,2-naphthol, HCl, Sodium Nitrite, Sodium Hydroxide Beakers, Dropper, Magnetic stirrer, Thermometer, Ice-Bath, Filtration system, Ethanol, Fibers sample, analytical balance, FTIR	None
7	**Preparation of Soap**	Oil, Fat, Sodium hydroxide, Sodium Chloride, Ethanol. Water-bath, thermometer, magnetic stirrer, filtration system, Round-bottomed flask, analytical balance	None

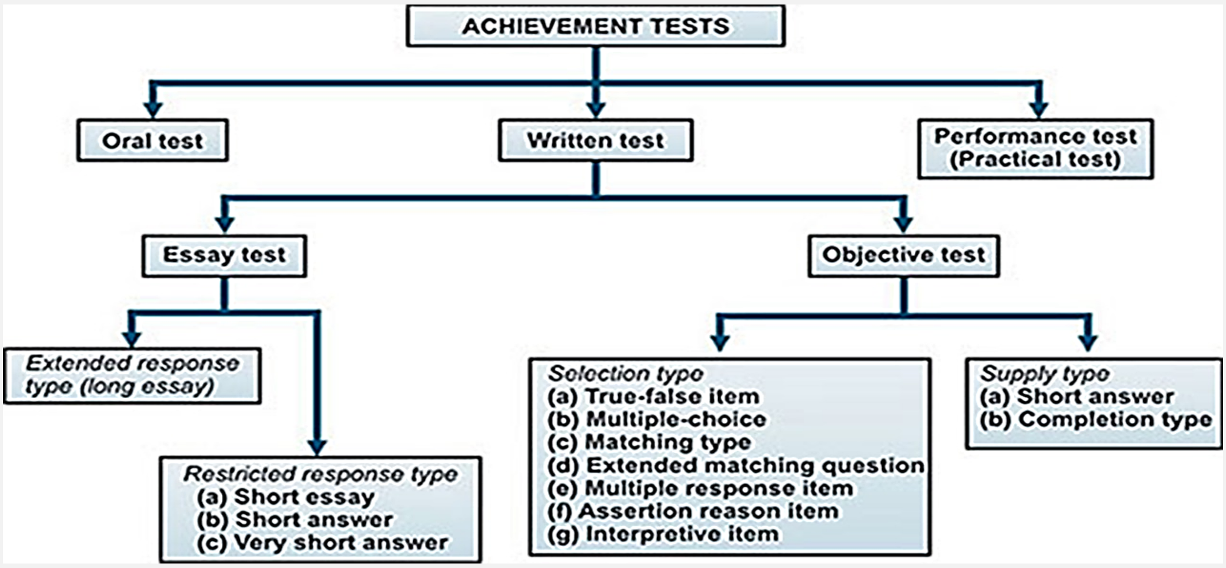
8	**Synthesis of Biodiesel and studying its properties**	Oil, Fat, Potassium hydroxide, Sodium Chloride, Calcium chloride anhydrous, Acetic acid. Water-bath, Separating funnel, Conical flask, analytical balance	None
9	**Creams**	oils, fats, Borax, Mineral oil, water and waxes. Beakers, Water-bath, magnetic stirrer, Thermometer, Filter papers, analytical balance	None
10	**Preparation of glyptal resin.**	phthalic anhydride anhydrous sodium acetate ethylene glycol glycerol analytical balance 2 large test tubes (20- x 150-mm) 1-mL graduated pipette Bunsen burner ring stand 2 utility clamps (not rubber coated clamps) FTIR (optional) melting point apparatus (optional) small test tubes or spot plate (optional) assorted solvents such as water, alcohol, acetone,	None
11	**Presentation/Report rubric /Assessment**	Theoretical	

2- Blue Print

Course Name	Organic Applied Chemistry
Course Code	438 Chem -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	10	18	42	20	4	--	6	-----

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (10 M)	Quiz	Objective question	5 5	10	1
			Mid term	Objective question	4 2	2 1	2
			Final Exam	Objective question	7	7	7
	K2	1.2 (18 M)	HW	Essay question	10	10	2
			Mid term	Essay question	3	3	3
			Final Exam	Essay question	4	13	13
Skills	S1	2.1 (42 M)	HW	Essay question	4	2	2
			Mid term	Essay question	4	10	10
			Final Exam	Essay question	6	30	30
	S2	2.2 (20 M)	Practical Sheet	Objective question	10	5	5
			Lab Report	10 experiments	10	10	10
			Final Lab Exam	1 task experiment	1	5	5
	S3	2.3 (4 M)	Safety EXAM	Objective question	8	4	4
Value	V1	3.1 (6 M)	Continuous assessment	Group evaluation rubric	--	6	6
Total		100				100	100 %


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Applied Organic Chemistry**
Course Code:	**438 CHEM-3**
Program:	**Bachelor in Chemistry**
Department:	***Chemistry***
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**25 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 12* *Year 4*
4. Course general Description	

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre- requisite
		Lec.	Prac.				
Applied Organic Chemistry	CHEM 438	2	2	3	4	12	232 CHEM3

The main purpose of Applied organic chemistry course is giving the students basic information about the petroleum, Petrochemicals, Polymers, and Dyes with their classifications, applications and their uses.

Course objectives: They are to identify the following.

- *Discuss the occurrence, extraction, properties of petroleum and application of fractional distillation, catalytic cracking and catalytic reforming during petroleum processing.*
- *Describe using equations and flow diagrams, the manufacture of some petrochemicals, namely, ethylene, propylene, synthetic gas, benzene and inorganic petrochemicals.*
- *identify polymers, their physical properties and different kinds of addition polymerization*
- *Identify the characteristics of some common polymers and the industrial importance of polymers and their uses in various fields.*
- *Identify the types of pigments and paints.*
- *Discuss the classification, synthesis and uses of dyes.*

Syllabus: A-Theoretical contents

The course is designed to give the students an idea about the polymer science – definition, classification of polymers, and polymerization by addition (chain reaction) – ionic polymerization (anionic and cationic) – free radical polymerization –polymerization by condensation– (linear polymerization– cross section polymerization). Introduce an idea about petroleum, Petrochemicals and industrial applications of organic chemistry, such as organic polymers and their uses in various fields and the manufacture of dyes and paints.

Syllabus: B-Practical contents

Basic knowledge concerning general Safety Rules, Lab Equipment, Purification of Organic Compounds, synthesis of some polymers, soap, cream, some dyes and examine their properties and their applications.

5. **Pre-requirements for this course (if any):** ***232CHEM3***
6. **Co- requirements for this course (if any):** ***None***
7. Course Main Objective(s) ***The main purpose of Applied organic chemistry course is giving the students basic information about the petroleum, Petrochemicals, Polymers, and Dyes with their classifications, applications and their uses.***

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge and understanding of industrial chemistry, petroleum, petrochemicals, polymer, and dyes.* (P)	K (1.1)	***lecture/ discussion Seminars/presentation***	***Objective question***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	*Describe the uses and applications of petrochemicals, polymers, and dyes in our life.* (P)	K (1.2)	***lecture / discussion / Seminars /Individual presentation***	***Essay question***
2.0	Skills; (Upon completion of the course, student will be able to)			
2.1	*Demonstrate ability in critical thinking, analyzing reaction mechanisms and classifying industrial compounds.* (P)	S (2.1)	***lecture / discussion / Seminars /Individual presentation***	***Solving Problems & Essay question***
2.2	*Apply their experimental basics and skills to use laboratory equipment, modern instructions, and classical techniques for carrying out experiments in polymers, dyes and petroleum and write a report representing the scientific data.* (P)	S (2.2)	***Lab work, group work***	***Objective question, Essay question, lab report rubric***
2.3	*Examine and follow proper procedures and regulations for safe handling, use, and disposal of chemicals.* (P)	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 in cooperation with other colleagues.* (P)	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.	**Definitions, origin, and composition of crude oil.**	2
2.	**Characterization and classification of crude oil.**	2
3.	**Basic petroleum refining.**	2
4.	**Petrochemicals, classifications, uses and applications.**	2
5.	**Definition, Properties, and classifications of Polymers.**	2
6.	**Addition Polymerization.**	2
7.	**Condensation Polymerization.**	2
8.	**Application of industrial polymers.**	2
9.	**Introduction and Classifications of Dyes.**	2
10.	**Preparation, uses, and applications of dyes.**	2
11.	**Paints, types, constitutions and applications.**	2

12.	***selected experiments covered the course topics, Polymer synthesis, synthesis of some dyes, Soap manufacture...etc.*.**	22
Total		44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Homework assignment***	***3-10***	***4%***
2.	***Lecture Quizzes***	***4***	***1%***
3.	***Mid-term exam***	***6-8***	***15%***
4.	***LAB Sheet***	***10***	***5%***
5.	***Quiz in Safety***	***11***	***4%***
6.	***Final practical exam***	***11***	***5%***
7.	***Lab report***	***2-10***	***10%***
8.	***Group work evaluation***	***2-10***	***6%***
9.	***Final Exam***	***12-13***	***50%***
	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	**Industrial Organic Chemicals by Harold A. Wittcoff, Bryan G. Reuben and Jeffery S. Plotkin, 2012 | ISBN: 0470537434**
Supportive References	كتاب الصناعات البترولية والبتروكيماوية ... تأليف أ. د سالم بن سليم الذياب كيمياء و تقنية البوليمرات بواسطة أ. د. سالم سليم الذياب
Electronic Materials	• https://en.wikipedia.org/wiki/Chemical_industry • http://www.rsc.org/learn-chemistry • https://www.khanacademy.org/science/organic-chemistry • https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.htm • https://chem.libretexts.org/
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• 1 Lecture room(s) for groups of 50 students • 1 Laboratory for a group of 25 student

Items	Resources
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	Bunsen burner, reagent bottles, beakers, Buchner funnel, Test tube and many more. Scientific videos

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of student's assessment	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

While specific laboratory experiments vary depending on the instructor and the semester, the following list is representative of the experiments that are used:

Week	EXP, titles	Chemicals and tools	Remarks
1	**Phenol formaldehyde resin**	Glacial acetic acid, 40% formaldehyde solution, Phenol, conc. HCl. Glass rod, beakers, funnel, heater and filter paper, analytical balance, FTIR.	None
2	**Urea- Formaldehyde Resins**	Urea, Formaldehyde, 35-40 % neutral solution, Oxalic acid, saturated solution. Concentrated ammonia solution Conc. HCl. Flame, Beakers, Test Tubes, Filter papers, Funnels, filtration system, analytical balance	None
3	**Determination of Saponification Value**	Fat, Oil, Fatty acids, Standard N/2 HCl, Alc. KOH and phenolphthalein. Round bottom flask, burette, pipette, water condenser, water bath, analytical balance.	None
4	**DETERMINATION OF PURITY ANILINE SALTS**	Aniline hydrochloride, Aniline sulfate, Standard 0.1N HCl, and phenolphthalein. burette, pipette, conical flasks and dropper, analytical balance	None
5	**Determination of the Equivalent Weight of a Carboxylic Acid**	*Barium hydroxide solution 0.05N, phenolphthalein, carboxylic acids* Burette, pipette, conical flasks and dropper, analytical balance	None
6	**Preparation of para-Red and Dyeing**	4-Nitroaniline,2-naphthol, HCl, Sodium Nitrite, Sodium Hydroxide Beakers, Dropper, Magnetic stirrer, Thermometer, Ice-Bath, Filtration system, Ethanol, Fibers sample, analytical balance, FTIR	None
7	**Preparation of Soap**	Oil, Fat, Sodium hydroxide, Sodium Chloride, Ethanol. Water-bath, thermometer, magnetic stirrer, filtration system, Round-bottomed flask, analytical balance	None

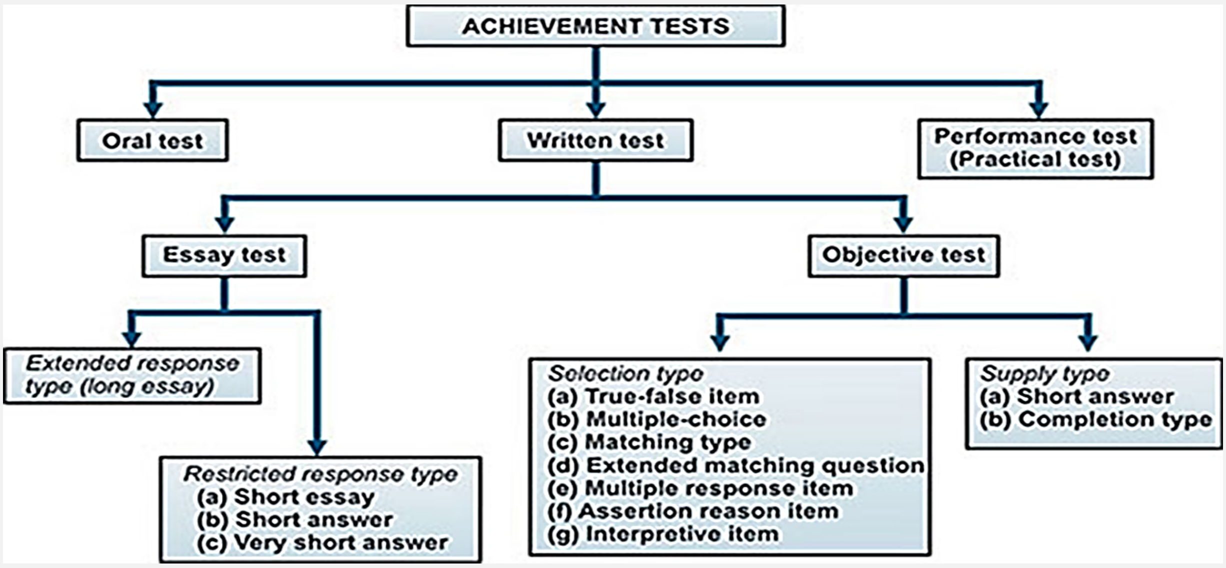
8	**Synthesis of Biodiesel and studying its properties**	Oil, Fat, Potassium hydroxide, Sodium Chloride, Calcium chloride anhydrous, Acetic acid. Water-bath, Separating funnel, Conical flask, analytical balance	None
9	**Creams**	oils, fats, Borax, Mineral oil, water and waxes. Beakers, Water-bath, magnetic stirrer, Thermometer, Filter papers, analytical balance	None
10	**Preparation of glyptal resin.**	phthalic anhydride anhydrous sodium acetate ethylene glycol glycerol analytical balance 2 large test tubes (20- x 150-mm) 1-mL graduated pipette Bunsen burner ring stand 2 utility clamps (not rubber coated clamps) FTIR (optional) melting point apparatus (optional) small test tubes or spot plate (optional) assorted solvents such as water, alcohol, acetone,	None
11	**Presentation/Report rubric /Assessment**	Theoretical	

2- Blue Print

Course Name	Organic Applied Chemistry
Course Code	438 Chem -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	10	18	43	20	4	--	6	-----

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (10 M)	Quiz	Objective question	5 5	10	1
			Mid term	Objective question	4 2	2 1	3
			Final Exam	Objective question	6 2	3 4	6
	K2	1.2 (18 M)	HW	Essay question	10	10	2
			Mid term	Essay question	3	5	4
			Final Exam	Essay question	4	12	12
Skills	S1	2.1 (42 M)	HW	Essay question	12	24	2
			Mid term	Essay question	4	7	9
			Final Exam	Essay question	6	32	32
	S2	2.2 (20 M)	Practical Sheet	Objective question	10	5	5
			Lab Report	10 experiments	10	10	10
			Final Lab Exam	1 task experiment	1	5	5
	S3	2.3 (4 M)	Safety EXAM	Objective question	8	4	4
Value	V1	3.1 (6 M)	Continuous assessment	Group evaluation rubric		6	6
Total		100				100	100 %


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Principles of Biochemistry**
Course Code:	**439 CHEM-3**
Program:	**Bachelor in Chemistry**
Department:	***Chemistry***
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**25 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 12 Year 4
4. Course general Description	

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre- requisite
		Lec.	Prac.				
Principles of Biochemistry	CHEM 439	2	1	3	4	12	232CHEM3

This course aims to provide students basic principles and definition of biochemistry, structure, functions and a general idea of metabolic reactions, biological functions of proteins, amino acids, enzymes and Nucleic acids. Carbohydrates studies and their function and Glucose oxidation to get energy. Lipids and their biological importance

Course objectives: They are to identify the following.

- *The importance of biochemistry in our life.*
- *Biological fluids and metabolic reactions (catabolic and anabolic)*
- *Nucleic acids, its structure and functions (DNA and RNA).*
- *Enzyme's classification, regulation, factors affecting enzyme action.*

Syllabus: A-Theoretical contents

General introduction to the study of biomolecules – biological fluids - metabolic reactions (catabolic and anabolic) – production of bioenergetics – structure and function of macro bio-molecules, including proteins, amino acids, enzymes and carbohydrates (monosaccharides , disaccharides and polysaccharides) – Biological oxidation of glucose to obtain energy - lipids – classification and biological importance – structure and function of lipids - Fatty acids – beta oxidation of fatty acids to obtain energy – nucleic acids; structure and function - DNA and RNA, structure and function

Syllabus: B-Practical contents

Selected experiments related to Biochemistry analysis

5. Pre-requirements for this course (if any): ***232CHEM3***

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

7. Course Main Objective(s)
This course aims to provide students basic principles and definition of biochemistry, structure, functions and a general idea of metabolic reactions, biological functions of proteins, amino acids, enzymes and Nucleic acids. Carbohydrates studies and their function and Glucose oxidation to get energy. Lipids and their biological importance.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 knowledge and an understanding of fundamental biochemistry principles, including bimolecular structure and metabolic pathways. (P)	K (1.1)	***lecture/ discussion Seminars/presentation***	***Objective question***
1.2	Explain the essential facts in biochemistry and correlate between	K (1.2)	***lecture / discussion / Seminars /Individual presentation***	***Essay question***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	the metabolic disorders and diagnosis of diseases. (P)			
2.0	Skills; (Upon completion of the course, student will be able to)			
2.1	Solve problems in biochemistry, differentiate between metabolic pathways and the energy production level from different biomolecules, and evaluate the level of different biological metabolites in biological fluids. (P)	S (2.1)	***lecture / discussion / Seminars /Individual presentation***	***Solving Problems & Essay question***
2.2	Design, carry out, and record the results of biochemical experiments using classical techniques and modern instruments, then analyze those results to draw reasonable, accurate conclusions and write reports. (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. (P)	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 in cooperation with other colleagues. (P)	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.	An introduction to biochemistry and water structure, hydrogen bonds, ionization, pH and buffer solutions.	**2**
2.	Carbohydrates, classification, Nomenclature of monosaccharides and their derivatives, isomerism and mutarotation.	**2**
3.	Reactions of monosaccharides, structures and functions of disaccharides and poly saccharides.	**2**
4.	Amino acids chemistry, classification and reactions.	**2**
5.	Peptide formation, protein functions, classification, separation, solubility and reactions.	**2**

6.	Enzyme's nomenclature, classification, mechanism, inhibitions and their types.	2
7.	Lipid's identification and classification. Triglycerides functions. Compound lipids (Conjugated and derived) and fatty acids Classification	2
8.	Chemical properties of fatty acids, rancidity, nucleic acid classification and structure.	2
9.	Types of nucleic acids, DNA Transcription, RNA translation and protein synthesis.	2
10.	Metabolism, Glycolysis and Kreb's cycle.	2
11.	Gluconeogenesis, phosphate pentose shunt and glycogenolysis.	1
12.	Beta Oxidation and digestion of proteins.	1
13.	Lab Experiments	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***	***3%***
2.	***Lecture Quizzes***		***4-8***	***2%***
3.	***Mid-term exam***		***6-8***	***15%***
4.	***Practical work***	***LAB Sheet***	***10***	***5%***
5.		***Quiz in Safety***	***11***	***4%***
6.		***Final practical exam***	***11***	***5%***
7.		***Lab report***	***2-10***	***10%***
8.		***Group work evaluation***	***2-10***	***6%***
9.	***Final Exam***		***12-14***	***50%***
	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	Lehninger, principals of biochemistry (sixth edition) by David L. Nelson Michafi M. Cox. W. H. FREEMAN AND COMPANY. New York. 2013
Supportive References	اسس الكيمياء الحيوية. الدكتور عبد المنعم الاعسر , المجلد الاول ,المكتبة الاكاديمية 2011
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	• www.wikipedia.org/ • ***http://www.wpi.edu/Academics/Depts/Chemistry/Courses/General*** http://med-mu.com/wp-content/uploads/2018/06/DM-Vasudevan-Textbook-of-Biochemistry-For-Medical-Students-6th-Edition.pdf

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	Colorimetric devices, Bunsen burner, microscopes, reagent bottles, beakers, Buchner funnel, Test tube and many more. Scientific videos

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of student's assessment	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

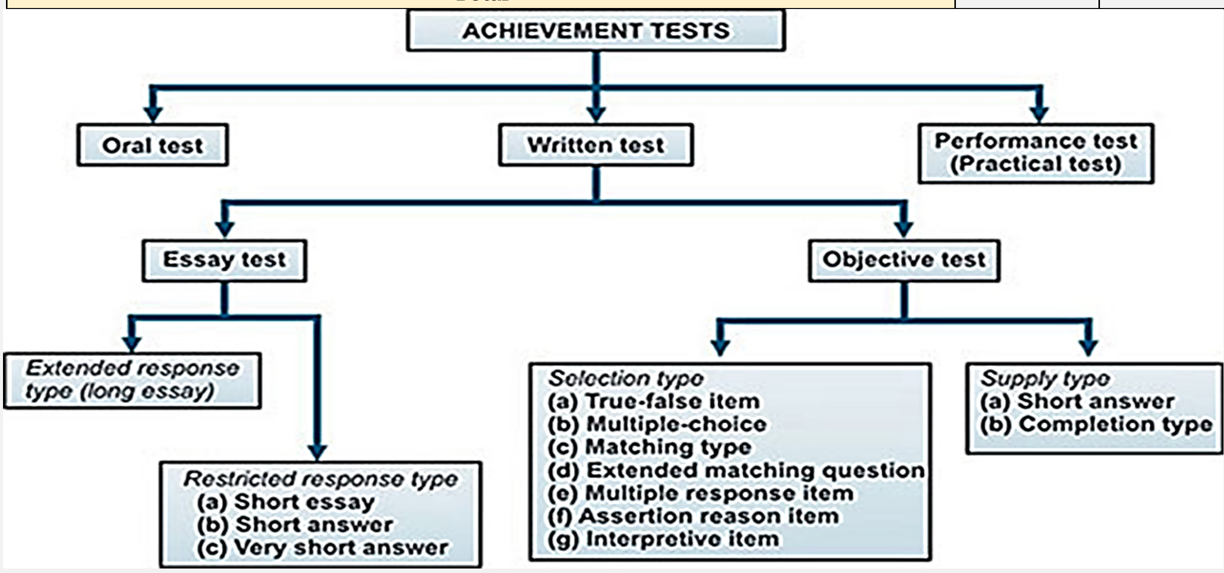
Week	EXP, titles	Chemicals and tools	Remarks
1	Course Introduction include: -Safety during handling with Chemicals and biological samples. Preparation of buffer solution.	Safety tools, and Devices	None
2-3	Carbohydrate detection	Molisch's, Barfoed. Reducing tests, Fehling's, Benedict's, Ammoniacal silver nitrate, Rapid furfural, furfural, Osazone formation and Iodine test	None
4	Estimation of the content of reducing sugars using Fehling's and Benedict's test	Fehling's and Benedict's reagent; copper (II) sulfate, potassium sodium tartrate, Potassium hydroxide	None
5	Estimation of glucose in serum by phenol-sulphuric acid method	Spectrophotometer, ethanol Phenol, Sulfuric acid, Water bath, Tubes with covers, filter paper, Cones	None
6	General tests for proteins	Ninhydrin reagent, copper sulfate in a strong base, sodium hydroxide solution, water bath	None
7	Solubility and Precipitation of protein	heavy metals (e.g., Hg2+, Pb2+, Cu2+), Alkaloidal reagents (e.g., tannate & trichloro acetate), by denaturation (heat coagulation test, strong acids, strong base)	None
7	Color reactions of proteins, Biuret test, Millon's test and Reduced sulfur test, Hopkins-Colé test	copper sulfate, sodium hydroxide, Millon's reagent, Hopkins-Colé reagent, H2SO4	None
8	Estimation of amino acid	-Using Ninhydrin - titration with potassium hydroxide in the presence of formaldehyde	None
9	Properties of fats and oils	Melting point, Crystallization, Viscosity, Density, Solubility, Refractive index, The Saponification number, iodine number, Rancidity	None
10	Estimation of triglyceride	4-chlorophenol, Magnesium aspartate, Sodium Azide	None

2- Blue Print

Course Name	Principle of Biochemistry
Course Code	439Chem -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	10	18	42	20	4	--	6	--

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (10 M)	Quiz	Objective question	5	5	1
			Mid term	Objective question	4	2	2
			Final Exam	Objective question	14	7	7
	K2	1.2 (18 M)	Quiz	Essay question	2	2	1
			Mid term	Essay question	2	4	4
			Final Exam	Essay question	4	13	13
Skills	S1	2.1 (42 M)	H. W	Essay question	6	3	3
			Mid term	Essay question	4	9	9
			Final Exam	Essay question	6	30	30
	S2	2.2 (20 M)	Practical Sheet	Objective question	10	5	5
			Lab Report	10 experiments	10	10	10
			Final Lab Exam	1 task experiment	1	5	5
	S3	2.3 (4 M)	Safety EXAM	Objective question	8	4	4
Value	V1	3.1 (6 M)	Continuous assessment	Group evaluation rubric	--	6	6
Total						100	100 %



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **SOLUTION CHEMISTRY**
Course Code: **445CHEM3**
Program: **Bachelor in Chemistry**
Department: **Chemistry**
College: **College of Science**
Institution: **Jazan University (JU)**
Version: **T104 2022**
Last Revision Date: **25 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 12* *Year 4*
4. Course general Description	

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Solution Chemistry	*445CHEM3*	*2*	*1*	*3*	*4*	*12*	*344CHEM3*

The course aims to give the students basic information about the Solution chemistry, Debye Huckel theory, conductivity measurements and its application, Transport numbers and Ion association

Course objectives: They are to identify the following.

- *Become acquainted with the theory and assumptions of Debye - Hückel*
- *Become acquainted with the electrolytic conductivities and their applications*
- *Become acquainted with the theory of diffusion and transport numbers and implications*
- *Identify Ion Association and the various theories that have addressed ion association.*

Syllabus: A-Theoretical contents

a) The scientific content of the theoretical part:

- *Debye – Hückel theory, Concentration and activity, Electrolytic conductance, Ionic association, Properties of electrolytic conductance, diffusion theory, Transport numbers, Theories of ion association, Bjerrum theory, Brönsted theory, Fuoss theory, Different methods for measurements of ion association*.

b) The scientific content of the practical part:

- *Some selected experiments in the field of chemical kinetics, thermo chemistry and solution chemistry.*

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content.

5. Pre-requirements for this course (if any): ***344CHEM***

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

7. Course Main Objective(s)

The course aims to give the students basic information about the Solution chemistry, Debye Huckel theory, conductivity measurements and its application, Transport numbers and Ion association

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad understanding and critical view on principal of Solution chemistry, Concepts and terminology of Solution chemistry topics including electrolyte solution, Debye	K(1.1)	***lecture / discussion Seminars /presentation***	***Objective question***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	Huckel (DHLL) Theory, Application of DHLL in determinations of solubility measurements, activity coefficient, electrolytic conductance, ion association theories ……etc. (P)			
1.2	Describe correctly the different phenomena associated with solution chemistry i.e.; Kohlrausch's laws for weak and strong electrolyte, Arrhenius theory, application of conductance measurements (P)	K(1.2)	***lecture / discussion / Seminars /Individual presentation***	Essay question
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	Demonstrate an ability in critical thinking, numeracy, statistical, analytical reasoning, use graphs, charts and to solving problems related to Debye Huckel theory, electrolytic conductance, different laws, and theories based on electrolytic conductance. (P)	S(2.1)	***lecture / discussion / Seminars /Individual presentation***	Solving Problems & chart analysis
2.2	Perform experiments in Solution chemistry, record, analyze, interpret the scientific data, and write reports. (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. (P)	S(2.3)	***lab demonstrations / hands-on student learning activities***	***Safety exam***
2.4				
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 in cooperation with other colleagues. (P)	V(3.1)	***lab demonstrations / whole group and small group discussion***	***Practical group work Rubric***
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	Basic concepts of solution chemistry	***3***
2.	Postulates of Debye – Huckel theory	***2***
3.	Derivation of Debye Huckel theory	***3***
4.	Experimental support for the limiting law Solubility of sparingly soluble salt	***3***
5.	Treatment of conductance data of weak electrolyte	***2***
6.	Transport properties in electrolyte	***2***
7.	Ionic velocity and mobility	***2***
8.	Electrolytic conductance	***2***
9.	Application of conductance measurements	***2***
10.	Ionic association	***2***
11.	Selected topics related to course content	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***	***4-6***	***3 %***
3.	***Mid-term exam***	***6-8***	***15 %***
4.	***LAB Sheet***	***15***	***5 %***
5.	***Quiz in Safety***	***11***	***4%***
6.	***Final practical exam***	***15***	***7 %***
7.	***Lab report***	***2-10***	***10 %***
8.	***Group work evaluation***	***2-10***	***4%***
9.	***Final Exam***	12-14	***50 %***
	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	An Introduction to Aqueous Electrolyte Solutions, by Margaret Robson Wright Formerly of St Andrews University, UK. Willy 2007.
Supportive References	Essentials Of Physical Chemistry. Bahl A., et al. S.Chand. 2010, English. 4ed. 1166\1166. 1122910
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	• https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=electrolyte+solution&type=wiki. • ***www.wikipedia.org/*** • ***http://www.wpi.edu/Academics/Depts/Chemistry/Courses/General/***

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

Week	EXPERMENTAL TITLE	Chemicals and Apparatus used	Remarks
1	Safety and regulations		
2	Revision on Determination of cell constant	Acids, bases, conductivity cell and conductivity meter	None
3	Revision on Determination of equivalent conductance of strong electrolyte	HCl, conductivity cell and conductivity meter	None
4	Revision on Determination of equivalent conductance of weak electrolyte	Acetic acid, conductivity cell and conductivity meter	None
5	Validation of Debye Huckel theory using Ionic strength Calculations	HCl, NaOH, conductivity cell and conductivity meter	None
6	Experimental validation of Kohlrausch's Law for weak electrolytes	HCOOH, Acetic acid, NH_4OH, conductivity cell and conductivity meter	None
7	Experimental validation of Kohlrausch's Law for strong electrolytes	KCl, NaCl, NaOH, conductivity cell and conductivity meter	None
8	Experimental Validation of Ostwald's dilution law	Acetic acid, conductivity cell and conductivity meter	None
9	Determination of ionization constant of some selected electrolytes	HCl, NH_4Cl, HCOOH, CH_3COOH, H_2SO_4, conductivity cell and conductivity meter	None

***For unavailable equipment's, we use some stimulated experiments through links as*:**

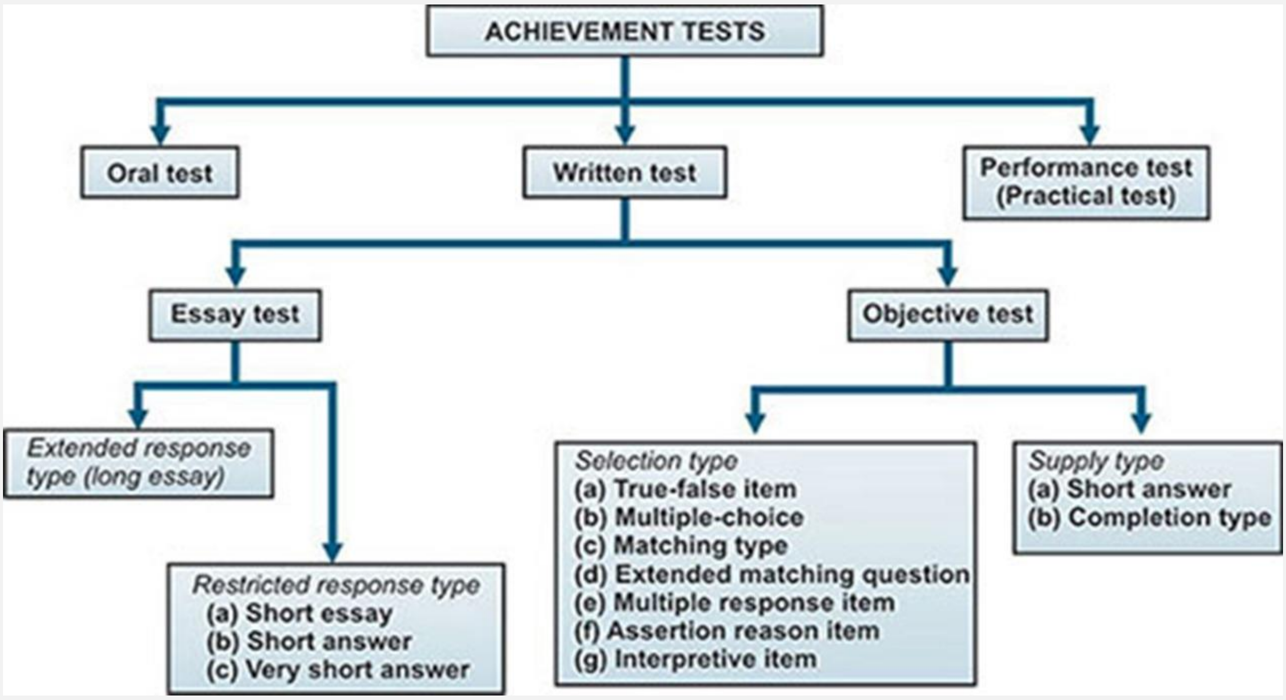
https://pages.uoregon.edu/tgreenbo/voltaicCellEMF.html
http://introchem.chem.okstate.edu/DCICLA/voltaicCell20.html

2- Blue Print

Course Name	Solution Chemistry
Course Code	445CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	12	20	38	21	4	--	5	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (12M)	Quiz	Objective question	1	1	1
			Mid term	Objective question	2	2	2
			Final Exam	Objective question	9	9	9
	K2	1.2 (20M)	Quiz	***Essay question***	2	2	2
			Mid term	***Essay question***	4	4	4
			Final Exam	***Essay question***	2	14	14
Skills	S1	2.1 (38M)	H.W	Solving Problems & chart analysis	4	2	2
			Quiz	Solving Problems & chart analysis	2	2	2
			Mid term	Solving Problems & chart analysis	2	5	7
			Final Exam	Solving Problems & chart analysis	6	24	27
	S2	2.2 (21M)	Practical Sheet	Objective question	6	3	3
				Essay question	2	2	2
			Lab Report	10 EXP.	10	10	10
			Final Lab Exam	Task	1	7	7
	S3	2.3 (4M)	Safety Quiz	Objective question	8	4	4
Value	V1	3.1 (5M)	Continuous assessment	Group evaluation rubric	-	5	5
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **Chemistry of Polymer**	
Course Code: **446CHEM2**	
Program: **Bachelor in Chemistry**	
Department: **Chemistry**	
College: **College of Science**	
Institution: **Jazan University (JU)**	
Version: **T104 2022**	
Last Revision Date: **28 December 2022**	

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	2h
2. Course type	
a.	University ☐ College ☐ Department☒ Track☐ Others☐
b.	Required ☒ Elective☐
3. Level/year at which this course is offered: Level 11 / Year 4	
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Chemistry of	*446CHEM2*	*2*	*0*	*2*	*4*	*11*	*342CHEM3*

This course aims to give students the basic principles of photochemistry and its chemical and biological applications

Course objectives: They are to identify the following.

1. ***Nomenclature, classification and synthesis of polymers***
2. ***Mechanisms and kinetics of polymer reactions***
3. ***structural morphology and composition of polymeric materials (Crystallinity and Amorphous polymers)***
4. ***Physical properties (Thermal ,mechanical and molecular weight distribution) of polymeric materials***
5. ***The applications of polymeric materials (packaging-Medical)***

Syllabus: A-Theoretical contents

The course is divided into 4 sections: Polymer solution behaviors - Physical and structural morphology of polymers - Mechanical and thermal properties of polymers

Syllabus: A-Practical contents

none

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

342CHEM3

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

none

This course aims to give students the fundamental principles of polymer chemistry, mechanism, kinetics, morphological structure and its chemical industrial applications.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge and understanding in polymer chemistry topics as, polymer monomer, polymerization, tacticity, crystalline and amorphous polymers, stress and strain , …. etc *(M)*	K (1.1)	Lecture group work discussion	Objective Q
1.2	describe the behaviors and properties of polymers as a function of their morphology, composition, thermal properties. ….etc *(M)*	K(1.2)	Lecture group work discussion	Short answer Questions
2.0	**Skills**; (Upon completion of the course, student will be able to)			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Demonstrate the knowledge and skills required to calculate the rate of polymerization reaction and solve problems in molecular weight distribution as well as calculate activity ratios in copolymer equation …….. etc (M)	S(2.1)	lecture group work discussion	Solving Problems & chart analysis
2.2	Use communication and on line technology to prepare a report/poster on selected polymer chemistry topic (M)	S((2.4)	project-based learning Technology-enabled learning	Research presentatio n rubric
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	Act with integrity and good ethics in the chemistry profession and their obligation to society (M)	V(3.2)	Research activities	Ethic check rubric

C. Course Content

No	List of Topics	Contact Hours
1.	Nomenclature , classification, and synthesis of polymers	***3***
2.	Mechanisms and kinetics of free radicals- ionic polymerization	***3***
3	Copolymerization and copolymer equation	***3***
4	Polymer solution behaviors	***3***
5	Molecular weight distribution and polydispersity index	***3***
6	Thermal and mechanical properties	***3***
7	Techniques and applications of polymer chemistry	***3***
8	Presentation Session	***1***
Total		22

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HW	7-8	5
2.	Mid-term Exam	5-8	25

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Presentation Session	11	6
4.	Ethic check	11	4
5.	Final EXAM	12-13	60
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	Introduction to Physical Polymer Science, Fourth Edition Author(s): L.H. Sperling 2006 John Wiley & Sons, Inc.
Supportive References	• Polymer Physics (Chemistry) by M. Rubinstein and Ralph H. Colby, 2003. Photochemistry, Past, Present and Future; Angelo Albini, Springer-Verlag Berlin Heidelberg 2016, ISBN 978-3-662-47976-6
Electronic Materials	Some course contents and materials are posted on Blackboard sites
Other Learning Materials	• https://www.longdom.org/scholarly/physical-chemistry-for-polymers-journals-articles-ppts-list-202.html • https://www.routledge.com/Polymers-for-Packaging-Applications/Alav • https://www.youtube.com/results?search_query=polymer+solutions • https://pubs.acs.org/doi/abs/10.1021/ed029p105. • https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=polymer+chemistry&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

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 & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

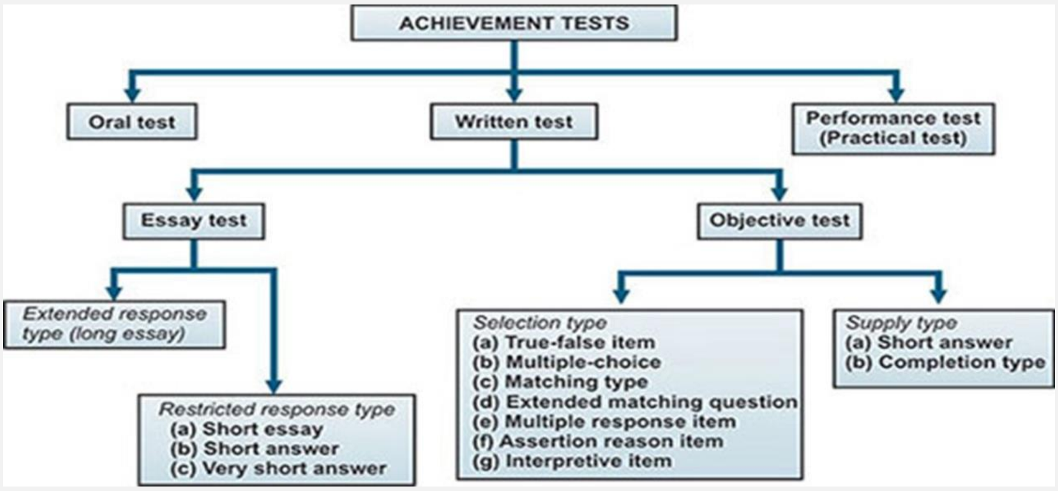
None

2- Blue Print

Course Name	Chemistry of Polymer
Course Code	446 CHEM

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1			2.2		3.1
Marks	10	20	60	---	---	5	---	5

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (10M)	HW	Objective Q	2	2	1
			Mid-term	Objective Q	4	2	2
			Final Exam	Objective Q	14	7	7
	K2	1.2 (20M)	HW	Objective Q	2	2	2
			Mid-term	Objective Q	5	5	5
			Final Exam	Objective Q	7	13	13
Skills	S1	2.1 (60M)	HW	Objective Q ,Solving Problems & chart analysis	3	3	2
			Mid-term	Objective Q ,Solving Problems & chart analysis	6	17	18
			Final Exam	Objective Q ,Solving Problems & chart analysis	8	40	40
	S4	2.2 (5M)	Research presentation	Research rubric	-	-	5
				PPT design	--	-	
				Oral discussion			
Value	V2	3.1 (5M)	Research ethic check	ethic check rubric			5
TOTAL		100					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test
(Practical test)
Essay test
Objective test
Extended response
type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Quantum Chemistry**
Course Code:	**447CHEM3**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**1 January 2023**

Table of Contents:

Content	Page

A. General information about the course:

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 9 / Year 3	
4. Course general Description	

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Quantum chemistry	*447CHEM3*	*3*	*0*	*3*	*3*	*9*	*Math 202*

This course aims to give students the basic principles of quantum theory and its applications on some chemical systems

Course objectives: They are to identify the following.

- *The nature of the classical mechanics as well as its failure to describe microscopic particles*
- *The historical development of the quantum theory and its postulates*
- *The application of quantum theory for H-atom as an example of simple chemical systems*

Syllabus: A-Theoretical contents

classical mechanics – black body radiation and photoelectric effect – Hydrogen electronic spectra – Compton-effect – De Broglie relation and dual nature of microscopic particles- Schrödinger equation- solution of SE for a particle in one (two and three) dimensional box – solution of SE for rigid rotor – solution of SE for harmonic oscillator – solution of SE for H-atom.

Syllabus: A-Practical contents

none

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

Math 202

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

none

7. Course Main Objective(s)

This course aims to give students the basic principles quantum theory and its applications on some chemical systems

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	33

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 a broad knowledge and understanding the course topics as, classical mechanics – black body radiation and photoelectric effect – Hydrogen electronic spectra – Compton-effect – De Broglie relation and dual nature of microscopic particles-Schrödinger equation,***	K (1.1)	Lecture group work discussion	Objective Q
1.2	***Describe the difference between classical and quantum mechanics, photoelectric effect, the contribution of scientists (Max Planck, Einstein, De Broglie, Heisenberg, Bohr, Balmer, and Schrödinger) to the quantum theory.***	K(1.2)	Lecture group work discussion	Short answer Questions

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	***Demonstrate the knowledge and numeracy skills in quantum mechanical solution of the rigid rotor and harmonic oscillator and the validity of the Schrödinger equation to model the particle in a box problem***	S(2.1)	lecture group work discussion	Solving Problems & chart analysis
2.2	***make effective use of communication, and online technology about quantum chemistry topics in order to improve their basic knowledge in writing (report and paper/ poster) with a good verbal and clear scientific language.***	S((2.4)	project-based learning Technology-enabled learning	Research presentatio n rubric
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	***Act with integrity and good ethics in chemistry profession and their obligation to society***	V(3.2)	Research activities	Ethic check rubric

C. Course Content

No	List of Topics	Contact Hours
1.	Historical Development of the quantum theory	8
2.	Schrödinger equation	5
3	Postulates of the quantum theory	5
4	Evaluation of the quantum theory	5
5	Applications of the quantum theory	8
6	Presentation Session	2
	Total	33

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HW	***4 - 9***	***5***
2.	Mid-term Exam	***5 - 8***	***25***
3.	Presentation Session	***11***	***6***

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
4.	Ethic check	***11***	***4***
5.	Final EXAM	***12 - 13***	***60***
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	Molecular Quantum Mechanics, Atkins PW, Friedman RS 4th ed. Oxford: Oxford University Press; 2005.
Supportive References	Quantum Chemistry: A Unified Approach, David B. Cook, 2nd Edition, imperial College Press; 2012.
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	• Faculty - Department of Chemistry - Simon Fraser University (sfu.ca) • Chemistry BSc (Hons) - Undergraduate Courses - University of Liverpool • Periodic Table of Elements and Chemistry (chemicool.com) • The Orbitron: a gallery of atomic orbitals and molecular orbitals (shef.ac.uk) • Home | Department of Chemistry (queensu.ca) • 11.2: Quantum Numbers for Electrons - Chemistry LibreTexts • Search - Chemistry LibreTexts • ***www.wikipedia.org/*** • المعرفة (marefa.org) • Courses | Chemistry & Biochemistry | Academics | WPI

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

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 & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

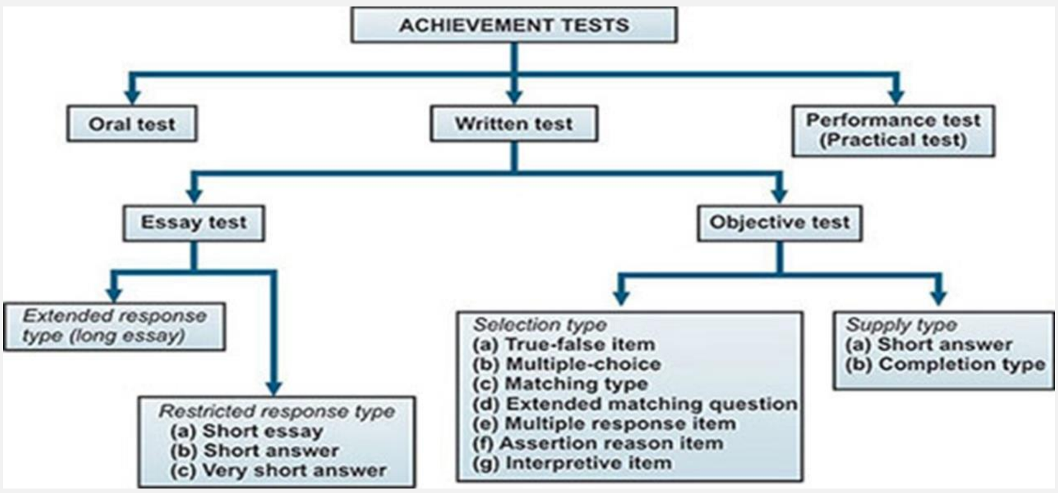
None

2- Blue Print

Course Name	Quantum Chemistry
Course Code	447 CHEM

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1			2.2		3.1
Marks	10	20	60	---	---	6	---	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 (10M)	HW	Objective Q	2	2	1
			Mid-term	Objective Q	4	2	2
			Final Exam	Objective Q	14	7	7
	K2	1.2 (20M)	HW	Short answer Questions	2	2	2
			Mid-term	Short answer Questions	5	5	5
			Final Exam	Short answer Questions	7	13	13
Skills	S1	2.1 (60M)	HW	Solving Problems & chart analysis	3	3	2
			Mid-term	Solving Problems & chart analysis	6	18	18
			Final Exam	Solving Problems & chart analysis	8	40	40
	S4	2.2 (6M)	Research presentation	Research rubric	-	-	2
				PPT design	-	-	2
				Oral discussion	-	-	2
Value	V2	3.1 (4)	Research ethic check	ethic check rubric	-	4	4
	TOTAL	100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**PHOTOCHEMISTRY**
Course Code:	**448CHEM2**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**22 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	2h
2. Course type	
a.	University ☐ College ☐ Department☒ Track☐ Others☐
b.	Required ☒ Elective☐
3. Level/year at which this course is offered: Level 12 / Year 4	
4. Course general Description	

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Photochemistry	*448CHEM2*	*2*	*0*	*2*	*4*	12	447*CHEM3*

This course aims to give students the basic principles of photochemistry and its chemical and biological applications

Course objectives: They are to identify the following.

- *Laws of photochemistry*
- *Experimental methods in photochemistry*
- *Mechanisms of photochemical reactions*
- *The applications of photochemistry*

Syllabus: A-Theoretical contents

Basic principles of photochemistry: Laws of photochemistry- Beer-lambert law - Fluorescence and phosphorescence- Photochemical reactions and quantum yield- Mechanisms of photochemical reactions- Experimental methods in photochemistry- The applications of photochemistry.

Syllabus: A-Practical contents

none

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

447CHEM3

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

none

7. Course Main Objective(s)

This course aims to give students the basic principles of photochemistry and its chemical and biological applications

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 a broad knowledge in photochemistry topics as, electromagnetic radiation, photochemistry, absorption of light, photochemistry laws and application, quantum yield, electronic and molecular translons, ... etc (M)	K (1.1)	Lecture group work discussion	Objective Q
1.2	Describe correctly photochemistry phenomena, essential facts, principles and theories across the nature of light and the photon, Jablonski diagram of energy. Frank-Condon principle, the degeneration of the excited states of the quantum yields....etc. (M)	K(1.2)	Lecture group work discussion	Short answer Questions

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	**Skills**; (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills required to use charts and solve problems in the relations of light and electromagnetic radiation. ,i.e, Beer-lambert law, quantum yield, stern-volmer equation…….. etc (M)	S(2.1)	lecture group work discussion	Solving Problems & chart analysis
2.2	Use communication and on line technology to prepare a report/poster on selected photochemistry topic. (M)	S((2.4)	project-based learning Technology-enabled learning	Research presentatio n rubric
3.0	**Values, autonomy, and responsibility**; (Upon completion of the course, student will be able to)			
3.1	Act with integrity and good ethics in chemistry profession and their obligation to society (M)	V(3.2)	Research activities	Ethic check rubric

C. Course Content

No	List of Topics	Contact Hours
1.	Meaning of photochemistry / photochemical Reactions	***3***
2.	Laws of photochemistry (Grotthurs-Draper law and Stark- Einstein law)	***3***
3	Criteria for photochemical reactions and Frank-Condon principle	***3***
4	Jablonski Diagram	***3***
5	Importance of photochemical reactions	***3***
6	Examples of photochemical reactions (Photo addition - Photosynthesis - Photocleavage - photoreduction)	***3***
7	Techniques and applications of photochemistry	***3***
8	Presentation Session	***1***
	Total	22

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HW	7-8	5
2.	Mid-term Exam	5-8	25

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Presentation Session	11	6
4.	Ethic check	11	4
5.	Final EXAM	12-13	60
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	Photochemistry; C. E. Wayne & R. P. Wayne, 1996, OUP primer Photochemistry, Past, Present and Future; Angelo Albini, Springer-Verlag Berlin Heidelberg 2016, ISBN 978-3-662-47976-6
Supportive References	Principles and Applications of Photochemistry, R. P. Wayne, 2009, John Wiley & Sons, Ltd, ISBN 978-0-470-01493-6.
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	• https://en.wikipedia.org/wiki/Photochemistry • https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/photchem.htm • http://photobiology.info/Photochem.html • https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Basic_Principles_of_Organic_Chemistry_(Roberts_and_Caserio)/28%3A_Photochemistry • https://pages.uoregon.edu/tgreenbo/voltaicCellEMF.html

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of students assessment	Instructor & Course coordinator	Class room evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

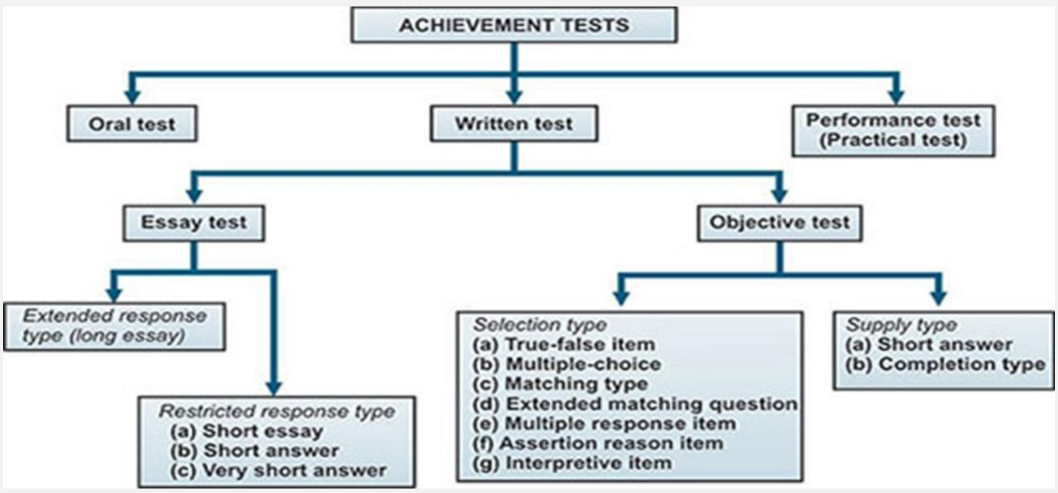
None

2- Blue Print

Course Name	PHOTOCHEMISTRY
Course Code	448 CHEM

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1			2.2		3.1
Marks	10	20	60	---	---	6	---	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 (10M)	HW	Objective Q	2	2	1
			Mid-term	Objective Q	4	2	2
			Final Exam	Objective Q	14	7	7
	K2	1.2 (20M)	HW	Short answer Questions	2	2	2
			Mid-term	Short answer Questions	5	5	5
			Final Exam	Short answer Questions	7	13	13
Skills	S1	2.1 (60M)	HW	Solving Problems & chart analysis	3	3	2
			Mid-term	Solving Problems & chart analysis	6	18	18
			Final Exam	Solving Problems & chart analysis	8	40	40
	S4	2.2 (4M)	Research presentation	Research rubric	-	-	2
				PPT design	-	-	2
				Oral discussion	-	-	2
Value	V2	3.1 (6)	Research ethic check	ethic check rubric	-	4	4
TOTAL		100					100



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Graduation Project**
Course Code:	**491CHEM-2**
Program:	Bachelor in **Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**22 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	2
2. Course type	
a.	University ☐ College ☐ Department☒ Track☐ Others☐
b.	Required ☒ Elective☐
3. Level/year at which this course is offered:Level12/Year4	Level 11 Year 4

Course Title	Course Number	Contact Hours		Credit Units	Year	Level	Pre-requisite
		Lec.	Prac.				
Graduation project	*491CHEM2*	*1*	*2*	*2*	*Four Year*	*11*	*Department Approval.*

4. Course general Description

The course of Graduation Project aims to give the students the opportunities to Choose, Conduct Literature Survey Conduct Survey of Materials and Methods, Conduct Laboratory and/or Field Work, Collect Experimental and/or Field Data, Express Experimental and/or Field Data, Write Scientific Paper, Write Results, Discuss Results and Present Thesis for Graduation Research Project and Viva.

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

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

7. Course Main Objective(s)

The course of Graduation Project aims to give the students the opportunities to:
Conduct, Express and Discuss Laboratory and/or Field Work.
Discuss Results and Write Scientific Paper.

Present Thesis for Graduation Research Project and Viva.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	11
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	33

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 a broad understanding and critical view of key theories, concepts, and terms in the field of research. (M)***	K (1.1)	***Oral discussion***	***Oral discussion***
1.2	***Describe correctly Chemical phenomena using chemical principles and scientific reasoning (M)***	K(1.2)	Lecture group work discussion	***Oral discussion***
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	***Demonstrate the ability to think critically, numerical, and statistical, and logical analysis, and to use graphs and diagrams***	S(2.1)	lecture group work discussion	***Oral discussion***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	to solve problems (in the research topic) (M)			
2.2	***Apply their experimental basics and skills to know laboratory equipment, modern instrumentation, and classical techniques used related to his research topic. (M)***	S(2.2)	• *lecture* • *Seminars* • *individual presentation* *case studies*	***Oral discussion***
2.3	***Examine his material and lab safety background to Follow proper procedures and regulations for safe handling and use of chemicals. (M)***	S(2.3)	• *lecture* • *Seminars* • *individual presentation* *case studies*	***MCQ***
2.4	***make effective use of communication, and online technology about chemistry topics in order to improve their basic knowledge in writing (report and paper/ poster) with a good verbal and clear scientific language. (M)***	S(2.4)	• ***lecture*** • ***Seminars*** • ***individual presentation*** ***case***	***Oral discussion***
3.0	Values, autonomy, and responsibility ; (Upon completion of the course, student will be able to)			
3.1	***Act with integrity and good ethics in chemistry profession and their obligation to society. (M)***	V(3.1)	Research activities	***Plagiarism Detection***
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	***Describe chemical phenomena correctly using chemical principles and scientific reasoning.***	2

2.	*Demonstrate the ability to think critically, numerically, statistically, logically, and use graphs and charts to solve problems (in the research topic)*	2
3.	*Apply their experimental basics and skills to know laboratory equipment, modern instrumentation, and classical techniques used related to his research topic.*	2
4.	*Examine his material and lab safety background to Follow proper procedures and regulations for safe handling and use of chemicals.*	2
5.	*make effective use of communication, and online technology about chemistry topics in order to improve their basic knowledge in writing (report and paper/ poster) with a good verbal and clear scientific language.*	2
6.	*Student response to supervisor's instructions during project preparation while adhering to ethical standards.*	1
Total		11

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Demonstrate a broad understanding of key theories, concepts, and terms in the field of research.*	*2-10*	*5*
2.	*Describe chemical phenomena correctly using chemical principles and scientific reasoning.*	*2-10*	*5*
3.	*Demonstrate the ability to think critically, numerically, statistically, logically, and use graphs and charts to solve problems (in the research topic)*	*2-10*	*30*
…	*Apply their experimental basics and skills to know laboratory equipment, modern instrumentation, and classical techniques used related to his research topic.*	*2-10*	*15*
	Examine his material and lab safety background to Follow proper procedures and regulations for safe handling and use of chemicals.	*2-10*	*10*
	make effective use of communication, and online technology about chemistry topics in order to improve their basic knowledge in writing (report and paper/ poster) with a good verbal and clear scientific language.	*2-10*	*20*

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
	Student response to supervisor's instructions during project preparation while adhering to ethical standards.	***2-10***	***10***
	The student's commitment to the ethical standards of writing during the preparation of the research	***2-10***	***5***
	Demonstrate a broad understanding of key theories, concepts, and terms in the field of research.	***2-10***	***5***

*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	***To be determined by supervisor from available sources***
Supportive References	***To be determined by supervisor from available sources***
Electronic Materials	The Purpose and Value of Scientific Research, *https://study.com/academy/lesson/what-is-scientific-research.html* *Types of Scientific Research, https://innspub.net › types-of-scientific-research* *What is Scientific Research and How Can it be Done, https://www.academia.edu/40888930/What_is_Scientific_Research_and_How_Can_it_be_Done*
Other Learning Materials	Platform connecting researchers with protocols and methods. Springer Nature Experiments

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	***1 Lecture room.***
Technology equipment (projector, smart board, software)	***Smart board, Data show, Black board, internet***
Other equipment (depending on the nature of the specialty)	***Saudi Digital Library***

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 & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

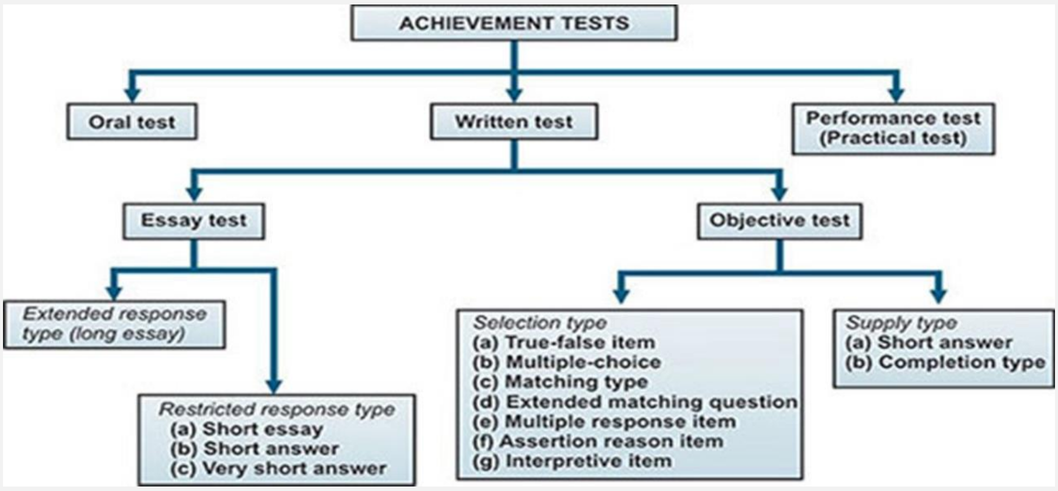
To be determined by the supervisor depending on the title of project and availability in the department …..etc.

2- Blue Print

Course Name	Graduation Project
Course Code	**491CHEM2-**

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	2.4	3.1	3.2
Marks	5	5	30	15	10	20	-	15

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (5M)	Theoretical discussion	Oral discussion		5	5
	K2	1.2 (5M)	Theoretical discussion	Oral discussion		5	5
Skills	S1	2.1 (30M)	Theoretical discussion	Oral discussion		10	10
			Viva discussion	Oral discussion		20	20
	S2	2.2 (15M)	Practical evaluation	Oral discussion		15	15
	S3	2.3 (10M)	Safety Quiz	MCQ		10	10
	S4	2.4 (20M)	Thesis discussion	Oral discussion		20	20
Values, Autonomy and Responsibility	V2	3.2 (15M)	Ethics of scientific research	Plagiarism Detection (Viva evaluation)		10	10
				Plagiarism Detection		5	5
TOTAL							100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **Organic Chemistry**	
Course Code: **203 CHEM-3**	
Program: **Bachelor in Biology**	
Department: **Biology**	
College: **College of Science**	
Institution: **Jazan University (JU)**	
Version: **T-104 2022**	
Last Revision Date: **23 January 2023**	

Table of Contents:

Content	Page

A. General information about the course:

Course Identification	
1. Credit hours:	
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered:	Level 4 Year 2
4. Course general Description	

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Organic Chemistry	*203 CHEM3*	*2*	*2*	*3*	*2*	*4*	*101CHEM4*

N

Course objectives: By the end of this course, students will be able to:

1- Identifying different ways for nomenclature of organic compounds.
2- To identify the functional groups in organic compounds.
3- To identify the saturated aliphatic hydrocarbons, methods of preparation and the
most important chemical reactions.
4- To define carbohydrates, amino acids and fatty acids

Syllabus: A-Theoretical contents

Introductory Concepts, structure and hybridization in organic compounds, Types of Organic reactions, functional groups and types of isomerism, Hydrocarbons (Alkanes, their cyclic forms) Nomenclature, preparation, natural source and chemical reactions, Alkenes and alkynes (Nomenclature, isomerism, preparation and reactions), Aromatic compounds benzene and its derivatives Nomenclature of aromatic compounds, Preparation and Electrophilic substitution for benzene, Alcohols, ethers and phenols Nomenclature, preparation and chemical reactions, Aldehydes and ketones Nomenclature, preparation and chemical reactions, Carboxylic acids and its derivatives Nomenclature, preparation and chemical reactions, Amines Nomenclature, preparation and chemical reactions, Definition of Carbohydrates, amino and fatty acids.

Syllabus: B-Practical contents

Selected experiments related to organic chemistry topics.

5. Pre-requirements for this course (if any): ***101CHEM4***

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

none

7. Course Main Objective(s)

This course aims to give students the basic knowledge concerning organic compound and related carbohydrates, amino acids, fatty acids.

1. Teaching mode (mark all that apply)

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

2. Contact Hours (based on the academic semester)

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

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 fundamentals of	K(1.1)	Lecture	Objective Questions

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	organic chemistry topics as, aliphatic and aromatic hydrocarbons and their reactions. (I)			
1.2	Describe correctly the atomic structure, bonding in organic chemistry, reactions of some organic compounds. (I)	K(1.2)	Lecture	Objective Questions
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate the knowledge and skills to predict the effect of function groups in the reaction results, types of bonds and hybridization. (I)	S(2.1)	Lecture	Essay Questions+ Solving Problems
2.2	Demonstrate the skills of designing and carrying out scientific experiments as well as accurately record and analyze the results of such experiments. (I)	S(2.2)	Laboratory	Objective Questions + Essay questions
2.3	know and follow proper procedures and regulations for safe handling, use, and disposal of chemicals (I)	S(2.3)	Group work Lab work	Objective Questions

C. Course Content

No	List of Topics	Contact Hours
1.	Introductory Concepts, structure and hybridization in organic compounds	1
2.	Types of Organic reactions, functional groups and types of isomerism	1
3.	Hydrocarbons (Alkanes, their cyclic forms) Nomenclature, preparation, natural source and chemical reactions.	3
4.	Alkenes and alkynes (Nomenclature, isomerism, preparation and reactions)	3
5.	Aromatic compounds benzene and its derivatives Nomenclature of aromatic compounds, Preparation and Electrophilic substitution for benzene	2
6.	Alcohols, ethers and phenols Nomenclature, preparation and chemical reactions.	3
7.	Aldehydes and ketones Nomenclature, preparation and chemical reactions.	3
8.	Carboxylic acids and its derivatives Nomenclature, preparation and chemical reactions	3

9.	Amines Nomenclature, preparation and chemical reactions.	2
10.	Definition of Carbohydrates, amino and fatty acids.	1
11.	Some experiments related to the course topics	22
	Total	44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework assignment	End of Each Chapter	5
2.	Mid-term exam	5th	15
3.	Safety Quiz	6th	3
4.	Practical Sheet	11th	7
5.	Final practical exam	11th	20
6.	Final Exam	12th	50
	total		100

*As8.sessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

9.

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	• Organic Chemistry (tenth edition) Written by T. W. Graham Solomons and Craig B. Fryhle http://chemistry.com.pk/books. • (أسس الكيمياء العضوية) الدكتور محمد بن ابراهيم الحسن والدكتور حسن بن محمد الحازمى 2019 الناشر دار الخريجى للنشر و التوزيع
Supportive References	• Organic Chemistry, Robert T. Morrison, Robert N. Boyd Translation copyright 2000 by Arab center for arabization, translation, authorship & publication (ACATAP, branch of ALECSO).
Electronic Materials	▪ https://www.pdfdrive.net/organic-chemistry ▪ https://clemermastio.files.wordpress.com/.../organic-chemistry solom. ▪ https://en.wikipedia.org/wiki/Organic_chemistry ▪ https://www.masterorganicchemistry.com/organic-1/
Other Learning Materials	▪ https://www.youtube.com/watch?v=n5vjCqnVb6s ▪ https://www.chemguide.co.uk/orgmenu.html ▪ https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.html

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ 1Lecture room for groups of 30 students. 1 Laboratory for group of 15 students
Technology equipment (projector, smart board, software)	Data show, smart Board, Chem Draw, power point and Active Inspire.
Other equipment (depending on the nature of the specialty)	Glassware, chemicals, hotplates, water bathes and flam.

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 & indirect)
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

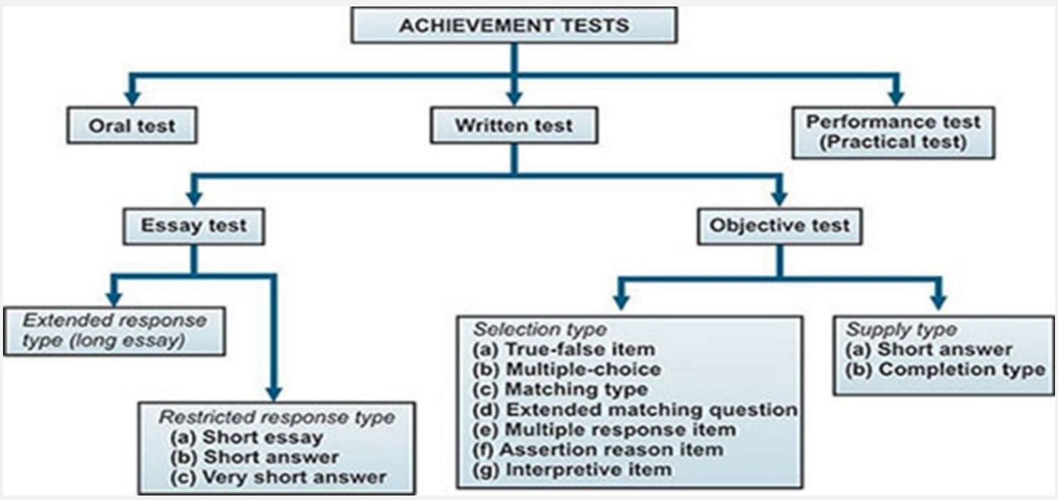
#	EXPERMENTS	Equipment, Chemicals and Tools.	No. of weeks for each experiment
1	General Safety Rules, Introduction of Basic Laboratory Techniques	Theoretical	1 week
2	Identification of Carboxylic Acid	**Chemicals:** Oxalic acid, tartaric acid , citric acid ,benzoic acid , salicylic acid , Phthalic Acid $FeCl_3$, $CaCl_2$, H_2SO_4 ,$KMnO_4$, Na HCO_3 Recersinol, NaOH(10%). **Tool**: test tubes, Beaker **Equp**. :water bath	2 weeks
3	Salts of carboxylic acid,	**Chemicals:** Amm.oxalate , Amm.tartarate , sod benzoate sod. Salicylate , $FeCl_3$, $CaCl_2$, NaOH , Na HCO_3 ,$AgNO_3$, **Tool:** test tubes, Beaker . **Equp.** :water bath	2 weeks
4	Aniline salt & Urea	**Chemicals:** Aniline HCl ,Aniline H_2SO_4,Urea , Na_2NO_2,β-naphthaol, $NaHCO_3$, $AgNO_3$,BaCl2 ,NaOH ,$CuSO_4$ **Tool**: test tubes, Beaker , ice bath. **Equp**. :water bath	1 week
5	Identification of carbohydrates	**Chemicals:** Glucose,galactose, ftuctose sucrose , maltose , maltose , lactose, starch , α – naphthaol , H_2SO_4 (conc) , barfoid reagent , iodine , Fehling's solution , Bendict reagent **Tool**: test tubes, Beaker . **Equp**. :water bath	2 weeks
6	Scheme and revision	All the chemicals and tool and equp. Written above	2 weeks
7	Final Exam		1 week

2- Blue Print

Course Name	Organic Chemistry
Course Code	203CHEM-3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	---	--	--
Marks	30	25	15	27	3	--	--	--

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	**K1**	**1.1 (30 M)**	Homework	Objective Q	2	**2**	**2%**
			Midterm	Objective Q	2	**7**	**7%**
			Final Exam	Objective Q	2	**21**	**21%**
	K2	**1.2 (25 M)**	Homework	Objective Q	2	**2**	**2%**
			Midterm	Objective Q	2	**5**	**5%**
			Final Exam	Objective Q	2	**18**	**18%**
Skills	**S1**	**2.1 (15 M)**	Homework	Solving Problems	2	**1**	**1%**
			Midterm	Solving Problems	2	**3**	**3%**
			Final Exam	Solving Problems	3	**11**	**11%**
	S2	**2.2 (27 M)**	Practical Sheet	Objective Q + Essay Q	7	**7**	**7%**
			Final Practical Exam	Report of Lab Exam	---	**20**	**20%**
	S3	**2.3 (3 M)**	***Safety EXAM***	Objective Q	6	**3**	**3**
TOTAL		**100**				**100**	**100%**



هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Biochemistry**
Course Code:	**204CHEM-3**
Program:	**Bachelor in Biology**
Department:	**Biology**
College:	**Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**28 December 2022**

Table of Contents:

Content	Page

A. General information about the course:

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 4* *Year 2*

1. Course Description

Course Title	*Course Number*	*Contact Hours*		*Credit unit (CU)*	*Year*	*Level*	*Prerequisite*
		Lect.	*Prac.*				
Biochemistry	204CHEM-3	2	2	3	2	4	203CHEM -3

Course objectives: They are to identify the following.

1- Biological compounds, their functional groups and bioactivity
2- Biosynthesis methods of different biological compounds
3- Chemical reactions and its composition and their metabolism

Syllabus: A-Theoretical contents

1- Definition and classification of carbohydrates, lipids, amino acids, proteins, nitrogenous bases and nucleic acids.
2- The composition and functions of carbohydrates, lipids, amino acids, proteins, nitrogenous bases and nucleic acids in living cells
3- Translation and transcription of nucleic acids
4- Enzymes and their role in stimulating cellular reactions - enzymatic accompaniments - power generation and transmission in the cell and factors affecting enzymatic reactions
5- The biosynthesis of some biological molecules.

Syllabus: B-Practical contents

- *Qualitative determination and quantitative estimation of some biological compounds belonging to carbohydrates (mono, di and polysaccharides), proteins and amino acids.*
- *Some chemical properties of lipids and fatty acids*

*See attachment

5. Pre-requirements for this course (if any): ***203 CHEM***

6. Co- requirements for this course (if any):*NON*

7. Course Main Objective(s)

This course aims to provide students with the basic knowledge about the main classes of biomolecules, their composition, properties, functions and their transformations in cells

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100 %
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

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

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 knowledge and understanding in biochemistry related to biology students including the identification, classification and properties of biological compounds. (I)		*lecture*	Objective Q Short answer Q
1.2	Describe the essential facts, principles and theories related to biochemistry and evaluate the level of different biological metabolites in biological fluids. (I)		*lecture*	Objective Q Short answer Q

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate critical thinking ability to differentiate and compare between biological compounds and different factors affecting biological and enzymatic reactions (I)		***Lecture***	Objective Q Short answer Q
2.2	Apply their experimental basics and skills to use laboratory equipment, modern instructions, and classical techniques to perform experiments of biochemistry (I)		***Lab. work***	***Lab report***
2.3	Examine and follow proper procedures and regulations for safe handling, use, and disposal of chemicals (P)		***Lab. work***	***Quiz in safety***
2.4				
3.0	Values, autonomy, and responsibility ; (Upon completion of the course, student will be able to)			
3.1				
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	An introduction to bio chemistry and water structure, hydrogen bonds, ionization, pH and buffer solutions.	2
2.	Carbohydrates, classification, Nomenclature of monosaccharides and their derivatives, isomerism and mutarotation.	2
3.	Reactions of monosaccharides, disaccharides and poly saccharides.	2
4.	Amino acids chemistry, classification and reactions.	2
5.	Peptide formation, protein functions, classification and separation.	2
6.	Enzymes nomenclature, classification, mechanism, inhibitions and their types.	2
7.	Lipids identification and classification. Triglycerides functions. Compound lipids (Conjugated and derived). Classification and fatty acids	2
8.	Chemical properties of fatty acids, rancidity, nucleic acid classification and structure.	2
9	Types of nucleic acids, DNA Transcription, RNA translation and protein synthesis.	2
10	Metabolism, Glycolysis and Kreb's cycle.	2
11	Gluconeogenesis, phosphate pentose shunt and glycogenolysis.	1
12	Beta Oxidation and digestion of proteins.	1
13	Lab Experiments	22
Total		

D. Students Assessment Activities

No	Assessment Activities *		Assessment timing (in week no)	Percentage of Total Assessment Score	
1.	*Homework assignment*		3 - 8	4 (4%)	
2.	Mid-term exam		~7	15 (15%)	
3.	*Lecture Quizzes*		*4 - 10*	1 (1 %)	
4	Practical	*Safety EXAM*	9	3	30%
		Sheet	11	7	
		Final practical exam		20	
5	Final Exam		12	50	
	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	Textbook-of-Biochemistry-For-Medical-Students-6th-Edition.pdf
Supportive References	• Lehninger, principales of biochemistry (sixth edition) by David L. Nelson Michafi M. Cox. W. H. FREEMAN AND COMPANY. New York. 2013 • Concise Text of Biochemistry. T.N Pattabiraman, 3rd Ed, 2001. اسس الكيمياء الحيوية. الدكتور عبد المنعم الاعسر , المجلد الاول, المكتبة الاكاديمية 2011
Electronic Materials	• https://www.khanacademy.org/science/biochemistry • https://www.biochemistry.org/ • https://en.wikipedia.org/wiki/biochemistry • https://www.masterorganicchemistry.com/
Other Learning Materials	• https://www.youtube.com/watch?v=cAxJw_W05ZY • https://www.chemguide.co.uk/orgmenu.html • https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.htm

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	none

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	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	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 **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

While specific laboratory experiments vary depending on the instructor and the semester, the following list is representative of the experiments that are used:

Week	EXP, titles	Chemicals and tools	hours
1	Course Introduction include: -Safety during handling with Chemicals and biological samples. Introduction to the devices used in the laboratory.	Safety tools, and Devices	2
2-3	Carbohydrate detection	Molisch's, Barfoed. Reducing tests, Fehling’s, Benedict’s, Ammoniacal silver nitrate, Rapid furfural, furfural, Osazone formation and Iodine test	4
4	Estimation of the content of reducing sugars using Fehling’s and Benedict’s test	Fehling’s and Benedict’s reagent; copper(II) sulfate, potassium sodium tartrate, Potassium hydroxide	2
5	Estimation of glucose in serum by phenol-sulphuric acid method	Spectrophotometer, ethanol Phenol, Sulfuric acid, Water bath, Tubes with covers, filter paper, Cones	2

6	General tests for proteins	Ninhydrin reagent, copper sulfate in a strong base, sodium hydroxide solution, water bath	2
7	Solubility and Precipitation of protein	heavy metals (e.g., Hg2+, Pb2+, Cu2+), Alkaloidal reagents (e.g., tannate & trichloro acetate), by denaturation (heat coagulation test, strong acids, strong base**)**	1
7	Color reactions of proteins, Biuret test, Millon's test and Reduced sulfur test, Hopkins-Colé test	copper sulfate, sodium hydroxide, Millon's reagent, Hopkins-Colé reagent, H2SO4	1
8	Estimation of amino acid	-Using Ninhydrin -titration with potassium hydroxide in the presence of formaldehyde	2
9	Properties of fats and oils	Melting point, Crystallization, Viscosity, Density, Solubility, Refractive index, The Saponification number, iodine number, Rancidity	2
10	Estimation of triglyceride	4-chlorophenol, Magnesium aspartate, Sodium Azide	2
11	Revision on the theoretical part of the experiments		2
12	FINAL EXAM		2

2- Blue Print

Course Name	Biochemistry
Course Code	CHEM-204

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3			
Marks	30	25	15	27	3			

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	**K1**	**1.1 (30 M)**	Homework	Objective Q Short answer Q	2	**2**	**2%**
			Midterm	Objective Q	2	**7**	**7%**
			Final Exam	Objective Q Short answer Q	2	**21**	**21%**
	K2	**1.2 (25 M)**	Homework	Objective Q Short answer Q	2	**2**	**2%**
			Midterm	Objective Q Short answer Q	2	**5**	**5%**

			Final Exam	Objective Q	2	18	18%
Skills	S1	2.1 (15 M)	Quiz	Objective Q	3	1	1%
			Midterm	Objective Q Short answer Q	2	3	3%
			Final Exam	Short answer Q	3	11	11%
	S2	2.2 (27 M)	Practical Sheet	Objective Q Short answer Q	7	7	7%
			Final Practical Exam	1 task experiment	---	20	20%
	S3	2.3 (3 M)	*Safety EXAM*	Objective Q	6	3	3%
TOTAL		100				100	100%