وزارة التعليم العالي والبحث العلمي

جـــهاز الإشـــراف والتقـويم العلـمي

دائرة ضمان الجودة والاعتماد الأكاديمي

استمارة وصف البرنامج الأكاديمي للكليات والمعاهد

للعام الدراسي 2022-2023

الجامعة : بغداد

الكلية /المعهد : العلوم

القسم العلمي : الكيمياء

تاريخ ملىء الملف : 2022/**10/1**

التوقيع :

اسم رئيس القسم : أ.م.د. ندى مطير عباس

التاريخ :**1/10/2022**

التوقيع :

اسم المعاون العلمي : أ.د. خالد جابر كاظم

التاريخ :**1/10/2022**

دقق الملف من قبل

شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي: أ.د. اسراء علي زيدان

التاريخ / /

التوقيع

مصادقة السيد العميد

أ.د. عبد الكريم عبد الله

Academic Program Description

This academic program description provides a concise summary of the main features of the program and the learning outcomes expected of the student, demonstrating whether he has made the most of the opportunities available. It is accompanied by a description of each course within the program.

University of Baghdad	1. Educational Institution
College of Science / Department of Chemistry	2. Academic Department/Center
Department of Chemistry	3. Name of Academic or Professional Program
Bachelor of Science in Chemistry	4. Name of Final Certificate
Semester	5. Academic System:
None	Annual/Courses/Other
Internet	6. Accredited Accreditation Program
1/9/2022	7. Other External Influences

1. Academic Program Objectives

Preparing specialists who are familiar with the basics of chemistry theoretically and practically, capable of meeting the needs of the labor market, in addition to Teaching chemistry to students of other departments in the College of Science.

Conducting scientific research and trying to keep pace with the scientific development of chemistry.

Cooperating with state institutions and the private sector by providing scientific advice and consultation and conducting chemical analyses.

2. Required program outputs and teaching, learning and evaluation methods

A- Cognitive objectives.

A1- Enabling students to gain knowledge and understanding of the intellectual framework of chemistry

A2- Enabling students to gain knowledge and understanding of international chemical standards

A3- Enabling students to gain knowledge and understanding of the laws of chemistry

A4- Enabling students to gain knowledge and understanding of the standards of chemical analysis

A5- Enabling students to gain knowledge and understanding of the law of misuse of chemicals

A6- Enabling students to gain knowledge and understanding of chemistry systems

A7- Enabling students to gain knowledge and understanding of chemistry in English

B- Program specific skill objectives:
B1- Scientific and practical skills
B2- Recall and analysis skills
B3- Use and development skills

Teaching and learning methods

Providing students with the basics and topics related to knowledge and systems explained in:
1- Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using (LCD) and (Data show) screens
2- Providing students with knowledge through assignments Homework for school vocabulary
3 - Asking students to visit the library to gain academic knowledge related to school vocabulary
4 - Improving students' skills by visiting websites to gain additional knowledge of school subjects

Evaluation methods

Daily tests with multiple-choice questions for school subjects
- Participation grades for difficult competitive questions for students
- Setting grades for assigned homework
- Qualitative and quantitative practical tests in laboratories

C- Emotional and value-based objectives:
C- Thinking skills and scientific problem-solving skills
C 1 - Enabling students to solve problems related to the intellectual framework of chemistry
C 2 - Enabling students to solve problems related to international chemistry standards
C 3 - Enabling students to solve problems related to the laws of control and quality of chemistry
C 4 - Enabling students to solve problems related to chemistry and in the English language
Teaching and learning methods

Providing students with the basics and additional topics related to the previous educational outcomes for problem-solving skills
Scientific

- Solving a set of practical examples by the academic staff
- Asking students During the lecture to solve some scientific issues

Evaluation methods

- Daily exams with multiple-choice questions that require scientific skills
- Daily exams with scientific and practical questions
- Participation grades for competition questions for academic topics
- Setting grades for homework
- Assigning students to do scientific seminars and discuss them

D - General and transferable qualification skills (other skills related to employability and personal development).

D1 - Enabling students to think and analyze topics related to the intellectual framework and international chemical standards

D2 - Enabling students to think and analyze topics related to company laws and chemical auditing standards

D3 - Enabling students to think and analyze topics related to language systems for importing chemicals

D4 - Enabling students to think and analyze topics related to chemistry in English

Teaching and learning methods

Providing students with the basics and additional topics related to the outputs of thinking and chemical analysis
- Forming discussion groups during lectures to discuss chemical topics that require thinking and analysis
- Asking students to ask a set of thinking questions during lectures such as what, how, when and why for specific topics
- Giving students homework that requires self-explanations in causal ways

Evaluation methods

Daily exams with self-solved homework questions
- Participation grades for competitive questions related to the subject matter
- Specific grades for homework

1. Program structure

Credit hours		Course name	Course code	Academic stage
practical	theoretical			
-	2	Analytical Chem.1 (Gravimetric analysis)	101 ChAC	First stage

-	2	Inorganic Chemistry (1)	102 ChIC	
2	2	Physics (1)	103 P	
2	1	Computer Science (1)	104 CS	
2	2	Geology (1)	105 GS	
-	2	Mathematics (1)	106 M	
-	1	Human Rights	107 HR	
-	2	Analytical Chem.2 (Volumetric Analysis)	108 ChSS	
-	1	Chemical Safety & Security (1)	109 ChAC	
4	-	Practical Analytical Chem.1 (qualitative & quanitative Analysis)	110 ChAC	
-	2	Inorganic Chemistry (2)	111 ChIC	
2	2	Physics (2)	112 P	
2	1	Computer Science (2)	113 CS	
2	2	Geology (2)	114 GS	
-	2	Mathematics (2)	115 M	
-	1	Democracy & Freedom	11 6 DF	
-	2	Analytical Chem. 3 (Organic Reagents &Thermal Analysis)	218 ChAC	**Second stage**
4	-	Practical Analytical Chem.2 (Separation technique)	219 ChPsT	
-	2	Inorganic Chemistry (3)	220 ChIC	
-	2	Physical Chemistry (1)	221 ChPC	
4	-	Practical Physical Chemistry (1)	222 ChPp	
-	2	Organic Chemistry (1)	223 ChOC	
-	2	Mathematics (3)	224 M	
2	1	Computer Science (3)	225 CS	
-	2	Analytical Chem. 4 (Separation Technique)	226 ChAC	
4	-	Practical Inorganic Chemistry (1)	227 ChPI	
-	2	Inorganic Chemistry (4)	228 ChIC	
-	2	Physical Chemistry (2)	229 ChPC	
-	2	Organic Chemistry (2)	230 ChOC	
4	-	Practical Organic Chemistry (1)	231 ChPO	
-	2	Mathematics (4)	232 ChM	
-	2	Inorganic Chemistry (5)	333 ChIC	**Third stage**

4	-	Practical Inorganic Chemistry (2)	334 ChPI	
-	2	Organic Chemistry (3)	335 ChOC	
4	-	Practical Organic Chemistry (2)	336 ChPO	
-	2	Physical Chemistry (3)	337 ChPC	
3	2	Biochemistry (1)	338 ChBC	
-	2	Industrial Chemistry (1)	339 ChIN	
-	2	Nano Chemistry (1)	340 ChNC	
-	2	Inorganic Chemistry (6)	341 ChIC	
-	2	Organic Chemistry (4)	342 ChOC	
-	2	Physical Chemistry (4)	343 ChPC	
4	-	Practical Physical Chemistry (2)	344 ChPpC	
3	2	Biochemistry (2)	345 ChBC	
-	2	Industrial Chemistry (2)	346 ChIN	
3	2	Radio Chemistry	347 ChRC	
-	2	Quantum & Spectroscopy (1)	448 ChQS	**Fourth stage**
3	2	Instrumental Analysis (1)	449 ChIA	
3	2	Biochemistry (3)	450 ChBC	
-	2	Polymer Science (1)	451 ChPS	
-	2	Petro Chemistry (1)	452 ChPT	
2	-	Research Projects	453 RP	
-	2	Identification Organic Compounds	454 ChIO	
4	-	Practical Identification of Organic Compounds	455 ChPiO	
-	2	Quantum & Spectroscopy (2)	456 ChQS	
3	2	Instrumental Analysis (2)	457 ChIA	
3	2	Biochemistry (4)	458 ChBC	
2	2	Polymer Science (2)	459 ChPS	
2	2	Petro Chemistry (2)	460 ChPT	
2	-	Research Projects	461 RP	
-	2	Nano chemistry (2)	462 ChNC	

1. Planning for personal development

- Follow up on scientific development by contacting international universities via the Internet
- Participation in scientific conferences inside and outside Iraq
- Participation in scientific workshops and seminars inside and outside Iraq
- Field visits to industrial projects

2. Admission criteria (setting regulations related to joining the college or institute)

Central - Scientific
According to the requirements of the Ministry of Higher Education and Scientific Research so that it matches the latest admission requirements in Iraqi universities

3. The most important sources of information about the program
- University requirements
- Local scientific trends
- Global scientific requirements
- Coverage of the specialized staff locally

Curriculum Skills Map

Please tick the boxes corresponding to the individual programme learning outcomes being assessed

Required Programme Learning Outcomes																			
General and transferable skills (other skills related to employability and personal development)				**Emotional and value goals**				**Program specific skill objectives**				**Cognitive objectives**				**Essential or optional**	**Course name**	**Course code**	**Year/Level**
د4	د3	د2	د1	ج4	ج3	ج2	ج1	ب4	ب3	ب2	ب1	أ4	أ3	أ2	أ1				
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Analytical Chem.1 (Gravimetric analysis)	101 ChAC	**First stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Inorganic Chemistry (1)	102 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Physics (1)	103 P	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Computer Science (1)	104 CS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Geology (1)	105 GS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Mathematics (1)	106 M	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Human Rights	107 HR	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Analytical Chem.2 (Volumetric Analysis)	108 ChSS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Chemical Safety & Security (1)	109 ChAC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Analytical Chem.1 (qualitative & quanitative Analysis)	110 ChAC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Inorganic Chemistry (2)	111 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Physics (2)	112 P	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Computer Science (2)	113 CS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Geology (2)	114 GS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Mathematics (2)	115 M	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Democracy & Freedom	11 6 DF	

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Analytical Chem. 3 (Organic Reagents &Thermal Analysis)	218 ChAC	**Second stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Analytical Chem.2 (Separation technique)	219 ChPsT	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Inorganic Chemistry (3)	220 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Physical Chemistry (1)	221 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Physical Chemistry (1)	222 ChPp	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Organic Chemistry (1)	223 ChOC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Mathematics (3)	224 M	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Computer Science (3)	225 CS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Analytical Chem. 4 (Separation Technique)	226 ChAC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Inorganic Chemistry (1)	227 ChPI	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Inorganic Chemistry (4)	228 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Physical Chemistry (2)	229 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Organic Chemistry (2)	230 ChOC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Organic Chemistry (1)	231 ChPO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Mathematics (4)	232 ChM	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Inorganic Chemistry (5)	333 ChIC	**Third stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Inorganic Chemistry (2)	334 ChPI	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Organic Chemistry (3)	335 ChOC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Organic Chemistry (2)	336 ChPO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Physical Chemistry (3)	337 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Biochemistry (1)	338 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Industrial Chemistry (1)	339 ChIN	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Nano Chemistry (1)	340 ChNC	

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Inorganic Chemistry (6)	341 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Organic Chemistry (4)	342 ChOC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Physical Chemistry (4)	343 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Physical Chemistry (2)	344 ChPpC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Biochemistry (2)	345 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Industrial Chemistry (2)	346 ChIN	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Radio Chemistry	347 ChRC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Quantum & Spectroscopy (1)	448 ChQS	**Fourth stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Instrumental Analysis (1)	449 ChIA	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Biochemistry (3)	450 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Polymer Science (1)	451 ChPS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Petro Chemistry (1)	452 ChPT	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Research Projects	453 RP	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Identification Organic Compounds	454 ChIO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Practical Identification of Organic Compounds	455 ChPiO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Quantum & Spectroscopy (2)	456 ChQS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Instrumental Analysis (2)	457 ChIA	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Biochemistry (4)	458 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Polymer Science (2)	459 ChPS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Petro Chemistry (2)	460 ChPT	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Research Projects	461 RP	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	basic	Nano Chemistry (2)	462 ChNC	

Course Description Form

For the first stage

First semester

2022-2023

Course Description/Analytical Chemistry I

This course description provides the study of chemical analysis steps and the identification of methods of expression of concentrationsWeight calculations and the processing of analytical results obtained using modern statistical analysis. The curriculum then deals with weight analysis and classification of weight analysis methods and sedimentary methods.		
University of Baghdad / College of Science	**Educational Institution**	.1
Department of Chemistry	**Scientific Department/Center**	.2
Analytical Chemistry (1) **101 ChAC/**	**Schedule Name/Code**	.3
Weekly	**Available forms of attendance**	.4
First semester / 2023-2022	**Chapter/Year**	.5
hours = 15 x 30 hours2	**Number of study hours (total)**	.6
1/9/2022	**Date of preparation of this description**	.7
Course Objectives The objective of teaching Analytical Chemistry for the first stage/first semester is to study analytical chemistry and its divisions, the steps of chemical analysis, and to identify methods of expressing concentrations, weight calculations, and processing analytical results obtained using modern statistical analysis. After that, the curriculum covers gravimetric analysis, classification of gravimetric analysis methods, sedimentation methods, study of sediment properties, gravimetric analysis calculations, weight coefficient, and solubility product constant calculations. It also aims to identify the factors affecting the solubility of sediments.		.8
An electronic class was also created within the Google Classroom program, and a class was also created in the form of a channel within the Telegram application for ease of communication and speed of accessing files to each student.		

Course outcomes, teaching, learning and assessment methods	.9
A- Cognitive objectives **A1- Identify the principles of calculating concentrations and weight units of the substance in the sample** **A2- Identify the methods of preparing solutions, whether from solid or liquid materials** **A3- Know the basics of gravimetric analysis, its types, and calculations of the gravimetric coefficient.** **A4- Study the calculations of the solubility product constant and know when sediments are formed mathematically** **A5- Study the properties of sediments and the factors affecting the solubility of sediments, as well as studying the factors affecting the formation of sediments**	
B - Course specific skill objectives **B1 - Teaching the student to benefit from the Internet unit to extract research and summary reports on the prescribed practical material** **B2 - Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation in standing in front of the board to solve some mathematical and statistical problems.** **B3 - Asking questions in the electronic class and answering them and giving assignments to solve mathematical problems** **B4 - Conducting a quick exam at a specific time to know the speed of students' response and interaction in the electronic class**	
Teaching and learning methods	
● Clarifying the scientific material through approved analytical books, creating paper lectures, and using Power Point technology to clarify the mechanisms used and some of the mechanics of the interactions under study. ● ● Creating an electronic class within the Google Classroom program, and also creating a class in the form of a channel within the Telegram application for ease of communication and speed of access to files for each student and for the purpose of discussing the topic of the lesson ● ● 3- Continuously benefiting from the World Wide Web unit (Internet).	
Evaluation methods	
1- Monthly written tests and an electronic test within the electronic class	

Putting inferential questions during the lecture and preparing homework -2 Conducting a quick daily exam during the lecture time -3 Submitting the required reports and research -4
C- Emotional and value-based goals **C1- Written tests and homework** **C2- It is necessary to listen to students' problems and strive to solve them.** **C3- Directing students to adhere to instructions inside the classroom, in person and electronically** **C4- It is necessary to communicate with students regarding the study material and follow the best available methods for ease of understanding for the student**
Teaching and learning methods
Finding stimulating questions for the student to make it easier for him to understand the theoretical material and using the board or a video presentation as part of presenting the topic under lecture, and noting that our dear students are aware and conscious that they are undergraduate students and committed to reading, attending lectures, taking monthly and short exams, and committed to university laws and regulations.
Evaluation methods
- Student activity in the lecture through answering oral and written questions and discussing the importance of analytical methods in detecting different materials, elements and compounds in all analytical models - Student attendance and commitment to lecture time - Daily and semester exams
D- General and transferable skills (other skills related to employability and personal development). D1-- Encouraging them to borrow scientific books from the university library to benefit from them scientifically D2- Selected groups of students are assigned to follow up on scientific research and articles in international journals D3- Discussing scientific research where it is presented by students using the display screen

D4- Discussing topics in the electronic class and facilitating the delivery of the material through displaying video films

Course Structure .10

Evaluation method	Teaching method	Required learning outcomes	Required learning outcomes	hours	Week
Homework -1 **Oral questions** -2 **Solving problems on the board** -3 **Monthly exams** -4	-Paper lectures -Power point presentation	**General introduction** **What is chemistry and its branches?** **What is analytical chemistry?** **Branches of analytical chemistry** **-Quantitative analysis** **-Qualitative analysis** **Application of analytical chemistry**	**General introduction** **What is chemistry and its branches?** **What is analytical chemistry?** **Branches of analytical chemistry** **-Quantitative analysis** **-Qualitative analysis** **Application of analytical chemistry**	**2 hours**	**the first**
Homework -1 **Oral questions** -2 **Solving problems on the board** -3 **Monthly exams** -4	-Paper lectures -Power point presentation	**Weight and concentration unites** **-Concentration** **-The mole** **-Examples** **-Molarity** **-Normality**	**Weight and concentration unites** **-Concentration** **-The mole** **-Examples** **-Molarity** **-Normality**	**2 hours**	**the second**
Homework -1 **Oral questions** -2 **Solving problems on the board** -3 **Monthly exams** -4	**-Paper lectures** **-Power point presentation**	**Percent concentrations** **-Part per million** **-Calculations of equivalent weight** **-Converting of percentage to molarity** **-The dilute solutions** **-Preparation of solid materials solutions** **-Preparation of liquid materials solutions**	**Percent concentrations** **-Part per million** **-Calculations of equivalent weight** **-Converting of percentage to molarity** **-The dilute solutions** **-Preparation of solid materials solutions** **-Preparation of liquid materials solutions**	**2 hours**	**the third**
Homework -1 **Oral questions** -2 **Solving problems on the board** -3 **Monthly exams** -4	**-Paper lectures** **-Power point presentation**	**Aqueous solution chemistry** **-Classification of electrolytes** **-Acid -Base theory**	**Aqueous solution chemistry** **-Classification of electrolytes** **-Acid -Base theory**	**2 hours**	**Fourth**

Homework -1 Oral questions -2 Solving problems on the board -3 Monthly exams -4	-Paper lectures -Power point presentation	Amphiprotic species -Autoprotolysis -Strengths of acid and bases	Amphiprotic species -Autoprotolysis -Strengths of acid and bases	2 hours	Fifth
	-	Exam. 1	Monthly exam 1	2 hours	Sixth
Homework 1- Oral questions-2 Solving problems-3 on the board Monthly exams-4	-Paper lectures -Power point presentation	Chemical equilibrium , Types of equilibrium, Equilibrium constants (Ionic -product constant of water, Solubility and Solubility product constant	Chemical equilibrium , Types of equilibrium, Equilibrium constants (Ionic -product constant of water, Solubility and Solubility product constant	2 hours	Seventh
Homework 1- Oral questions-2 Solving problems-3 on the board Monthly exams-4	-Paper lectures -Power point presentation	Dissociation of a weak acid or base, Hydrolysis constant (KH), Formation constant of complex	Dissociation of a weak acid or base, Hydrolysis constant (KH), Formation constant of complex	2 hours	The eighth
Homework 1- Oral questions-2 Solving problems-3 on the board Monthly exams-4	-Paper lectures -Power point presentation	Multistep equilibrium types, definitions, calculations, Effect of common ion, Effect of complex formation on solubility, and problems	Multistep equilibrium types, definitions, calculations, Effect of common ion, Effect of complex formation on solubility, and problems	2 hours	Ninth
Homework 1- Oral questions-2 Solving problems-3 on the board Monthly exams-4	-Paper lectures -Power point presentation	Activity and activity coefficient: definitions, examples, calculations	Activity and activity coefficient: definitions, examples, calculations	2 hours	tenth
Homework 2- Oral questions 3- Solving problems on the board 4- Monthly exams	-Paper lectures -Power point presentation	Ionic strength: definitions, examples, calculations	Ionic strength: definitions, examples, calculations	2hours	eleventh
-	-	Exam. 2	Monthly exam 2	2hours	twelfth

Infrastructure .11	
• **Required textbooks**	-Fundamental of analytical chemistry by Skoog, West, Holler & Crouch, 8th , 2004.
• **Main references (sources)**	1-Fundamental of analytical chemistry by Skoog, West, Holler, 6th , 1992. 2-Principles of instrumental analysis by Skoog, West, Holler & Crouch, 8th, 2004. 3-K. Burger D, Sc, "Organic regents in metal analysis", 1st,New York, 1973. 4-J.N.Miller & J.C. Miller" Statistical for anal. Chem..", 2nd, New York,1988.
• **Recommended books and references (scientific journals, reports, etc.)**	
• **Electronic references, websites**	

Curriculum Development Plan .12
-1 Expanding modern statistical processing and introducing modern statistical programs.
-2 Introducing some important organic reagents in analytical chemistry and necessary for estimating elements, compounds and pharmaceutical drugs.
-3 Increasing use of information technology or reliable Internet references as a result of keeping pace with the great development in the world of analytical techniques
-4 Benefiting from published scientific research that follows methods of weight analysis to learn how to treat samples and methods of estimation

Course Description / Analytical Chemistry (Practical)1

This course description provides an introduction to descriptive and volumetric analytical chemistry. Descriptive chemistry relies on describing a colorimetric or sedimentary method to determine the type of unknown ion, while volumetric chemistry relies on measuring the volumes of a substance equivalent to the substance of unknown concentration within titration processes and determining the unknown concentration.		
University of Baghdad / College of Science	**Educational institution** .1	
Department of Chemistry	**Scientific Department / Center** .2	
Practical analytical chemistry (1) **110 ChAC/**	**Course Name/Code** .3	
Weekly	**Available forms of attendance** .4	
First semester / 2023-2022	**Semester/Year** .5	
4 hours 60 = 15 x hours	**Number of study hours (total)** .6	
1/9/2022	**Date this description was prepared** .7	
	Course Objectives .8	
The aim of teaching the practical analytical chemistry course for the first stage / second semester is to introduce students to practical experiments in descriptive and volumetric analytical chemistry. Descriptive analytical chemistry depends on describing a colorimetric or sedimentary method to determine the type of the unknown ion, while volumetric chemistry depends on measuring the volumes of a substance equivalent to the substance of unknown concentration within the titration processes and determining the unknown concentration. And		

processing the analytical results obtained using modern statistical analysis.

Course outcomes, teaching, learning and assessment methods	.9
A- Cognitive objectives **A1- Identify the methods of preparing different chemical materials and benefiting from them in analytical chemistry.** **A2- Identify how to perform descriptive analysis and benefit from it in identifying the type of ions in different models.** **A3- Identify the types of volumetric analysis and how to conduct quantitative volumetric analysis using calibration tools.**	
B - Course specific skill objectives **B1- Teaching the student how to use laboratory equipment and prepare and use materials.** **B2- How to write reports and summarize and discuss the results obtained from the experiment.** **B3- Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation in standing in front of the board to solve some mathematical and statistical problems.** **B4- Teaching the student to benefit from the Internet to extract research and summarized reports on the prescribed practical material**	
Teaching and learning methods	
● Clarifying the scientific material through approved analytical books, creating paper lectures, and using Power Point technology to clarify the mechanisms used and some of the mechanisms of the interactions under study. ● Using Google Classroom to display lectures in the form of audio and video recordings. ● Proposed discussion within the lecture and in the electronic class. ● Continuous use of the World Wide Web (Internet).	
Evaluation methods	
● Conducting short surprise exams every week so that the student is aware and continuously reading the experiments related to the course. ● Conducting weekly exams using Google forms	

Evaluating the weekly reports submitted by the student after conducting the scientific experiment. ● Conducting monthly exams and evaluating external reports and research required from the student in the electronic class Google classroom ●
C- Emotional and value objectives **C1- The ability to deduce and suggest methods for estimating positive and negative ions based on volumetric analysis methods.** **C2- Developing skills related to suggesting methods for separating and estimating different ions in various sources**
D- General and transferable skills (other skills related to employability and personal development). **D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them.** **D2- Developing personal skills through scientific trips to sites specialized in chemical transactions.**

Course Structure.10

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	Week
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Laboratory Instructions and Glassware Identification	Review laboratory tools and equipment and how to use them	2	First
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Class analysis for the first group	Learn the principles of descriptive analysis and descriptive interactions of the first group of ions.	2	second
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Analysis of known samples for the first group	Test on sample analysis of information for the first group based on descriptive analysis	2	third
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Analysis of known samples for the first group	Test on sample analysis of information for the first group based on descriptive analysis	2	fourth
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Class analysis for the second group	Characteristic descriptive interactions of group II ions	2	fifth
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Analysis of the known samples of the second group	Test on the analysis of known samples for the second group	2	sixth

For exams and weekly reports	1- Paper lectures 2- Electronic screen	Analysis of unknown samples for the second group	Test on the analysis of unknown samples for the second group	2	Seventh
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Class analysis for the third group	Characteristic descriptive interactions of group III ions	2	egith
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Analysis of known samples for the third group	Test on the analysis of known samples for the third group	2	ninth
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Analysis of unknown samples for the third group	Test on the analysis of unknown samples for the third group	2	tenth
For exams and weekly reports	1- Paper lectures 2- Electronic screen	Comprehensive exam	Comprehensive exam	2	eleventh

	Infrastructure .11
Fundamentals of analytical chemistry /Skoog and West ,7th ed.,2000 -Fundamental of analytical chemistry by Skoog, West, Holler & Crouch, 8th , 2004.	**Required textbooks** ●
	Main references (sources) ●
	Recommended books and references (scientific journals, reports, etc.) ●
	• Electronic references, websites ●

Curriculum Development Plan .12
Update and add new experiences to the course

A- Knowledge and understanding
A1- Identify the elements of the periodic table and their periodic properties
A2- Identify the energy levels of the atom as well as its structure
A3- Study electromagnetic radiation
A4- Study ionic compounds and identify their crystalline forms

Course Description / Inorganic Chemistry I

This course description provides an introduction to the atomic structure and energy levels of the atom, as well as the study of quantum numbers and electronic arrangement, as well as the study of the energy of energy levels through the study of the term symbol and the effective charge of the nucleus, in addition to the study of ionic compounds and their crystalline forms.

1. Educational institution	University of Baghdad
2. University Department/Center	Faculty of Science / Department of Chemistry
3. Course Name/Code	inorganic chemistry (1) / **102 ChIC**
4. Available forms of attendance	Weekly
5. Semester/Year	First semester /2022-2023
6. Number of study hours (total)	2 hours30 = 15 x hours
7. Date this description was prepared	1/9/2022
8. Course Objectives	

The aim of teaching inorganic chemistry (1) for the first stage is to identify the atomic structure and energy levels of the atom, as well as to study quantum numbers and electronic arrangement, as well as to study the energy of energy levels by studying the term symbol and the effective charge of the nucleus, in addition to studying ionic compounds and their crystalline forms, the group of alkaline earth elements.

Learning outcomes, teaching and learning methods and assessment .9
A- Knowledge and understanding A1- Identify the elements of the periodic table and their periodic properties A2- Identify the energy levels of the atom as well as its structure A3- Study electromagnetic radiation A4- Study ionic compounds and identify their crystalline forms
B - Course specific objectives and skills B1 - Identify the atomic structure and the latest scientific findings
Teaching and learning methods
● Use the Google Class education platform ● Preparing reports and homework • Using YouTube videos Using illustrative tools and asking inferential questions
Evaluation methods
● Monthly tests ● Daily tests and discussions ● Reports and homework
Teaching and learning methods
Use the board and the projector screen to display pictures, drawings, models and bring illustrative models.
Evaluation methods
- Monthly and daily written tests, oral discussions, reports, student activity in lectures and attendance. -
D- General and transferable skills (other skills related to employability and personal development). D1- Encouraging students to rely on resources and use the library D2- Using the Internet to increase knowledge

Course Structure .10					
Evaluation method	**Teaching method**	**Name of unit/course or topic**	**Required learnin**	**hours**	**week**

			g outcomes		
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard -2	Atomic electronic structure		2 hours	1
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	quantum theory		2 hours	2
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Electromagnetic radiation		2 hours	3
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Bohr's theory and quantum numbers		2 hours	4-5
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Electronic arrangement and fixed blocking		2 hours	6-7
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Term code		2 hours	8
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Periodic table and periodic properties of the elements		2 hours	9
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Ionic compounds		2 hours	10
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Crystallization energy and crystalline properties		2 hours	11
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Polarity, polarizability and solubility		2 hours	12-13
Monthly exam, daily exam and discussion within the lecture	Paper lectures -1 Blackboard	Ionic structure and crystal forms		2 hours	14-15
11. Infrastructure					
1- Required Textbooks	**-Basic InOrganic chemistry by F.A.Cotton & G.Wilkinson.**				
2- Main References (Sources)	**1-Inorganic chemistry by G.E.Huheey** **Inorganic Chemistry for the first stage** 2				

12. Curriculum development plan
The increasing use of information technology, the extraction of reliable e-books, and the updating of vocabulary and curricula to ensure keeping pace with the great development in the world of technology.

Course Description / General Physics

University of Baghdad / College of Science	1. Educational Institution
Department of Physics	.2 University Department / Center
General Physics / **103 P**	3. Course name/code
Weekly	.4. Available attendance forms
First semester / 2023-2022	.5.Semester/Year

2 hours 15 X=30 hours	.6. Number of study hours (total)
1/9/2022	. 7. Date of preparation of this description

8. Course objectives

-1 Knowledge and familiarity with the concepts of general physics to be able to understand and analyze many scientific facts, the physical dimension of which is more accurate and comprehensive. An example of this is the movement of fluids (static and moving fluids).

-2 Service to prepare specialized graduates with physical skills in physics sciences in addition to their basic specialization, who contribute to serving development in the country.

-3 Meeting the needs of multiple sectors in the field of specialization with highly qualified cadres.

-4 Encouraging distinguished people in this field to work as teaching assistants in the department to be faculty members in the future.

-5 Achieving quality and academic accreditation.

.10 Learning Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive objectives

A1- Enabling students to gain knowledge and understanding of the concept of physics

A2- Enabling students to gain knowledge and understanding of the scientific laws in physics

A3- Enabling students to keep pace with scientific development in all scientific fields related to physics

B - Skill objectives

B1 - Scientific skills

B2 - Use and development skills

B3 - Thinking and analysis skills

B4 - Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation within the lecture.
Teaching and learning methods
• Clarifying and explaining the study materials • Providing students with knowledge • Asking students to visit the library to obtain academic knowledge • Improving students' performance by encouraging them to visit websites • Clarifying the scientific material through multiple examples, creating paper lectures, and using power point technology to explain solutions and applications. • Continuously benefiting from the World Wide Web (Internet) unit by displaying videos related to the subject.
Evaluation methods
Conducting short surprise exams for each student to be aware of and continuously read the lectures on the scientific material. Daily tests through multiple-choice questions Setting grades for daily assignments Setting grades for participation in difficult competitive questions.
C- Emotional and value-based objectives **C1- Enabling students to think and analyze topics related to the subject** **C2- Enabling students to think and analyze topics related to the laws of the sciences studied** **C3- Enabling students to think and analyze topics related to the scientific standards of study on a global scale** **C4- Giving students a number of external questions as homework and giving them the opportunity to think and find solutions.**

Teaching and learning methods
- Providing students with the basics and additional topics related to the outputs of thinking and analysis. - Asking a set of thinking questions during lectures such as (how, why, when, what is the reason) for the topics. - Giving students homework that requires self-explanations in scientific ways. - It is noted that our dear students are aware and conscious that they are undergraduate students and are committed to reading, attending lectures, taking monthly and short exams, and are committed to university laws and regulations.
Evaluation methods
- Daily exams with multiple-choice questions that require scientific skills - Daily exams with scientific questions. - Setting grades for daily assignments. - Evaluation and rewarding of distinguished students scientifically and those participating in seminars held in the College of Science.
D- General and transferable skills (other skills related to employability and personal development). D1- Conducting some scientific debates with other universities or well-known Developing personal skills -2د**scientific centers and honoring the outstanding ones among them.** by speaking - Developing personal skills by speaking Poetry debates through their participation in central celebrations Which is held within the university. D3- Enabling students to use models and forms. D4- Enabling students to pass job interviews. D5- Enabling students to develop themselves continuously after graduation.

10. Course structure					
Evaluation method	Teaching method	Name of unit/course or topic	Required learning outcomes	hours	week
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter One: One-Dimensional Motion	The student will be able to describe the position, distance and displacement of the motion of objects in addition to the motion of an object with constant acceleration.	2hours	first
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter One: One-Dimensional Motion	The student will be able to describe the free fall of objects in addition to the motion of projectiles.	2hours	second
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Two: Newton's Laws of Motion and the Balance of Forces	The student will be able to describe the types of forces.	2hours	Third
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Two: Newton's Laws of Motion and the Balance of Forces	The student will be able to describe and understand the various types of frictional forces.	2hours	fourth
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Two: Newton's Laws of Motion and the Balance of Forces	The student will be able to describe and understand inclined surfaces and how to deal with and construct equations of motion for inclined surfaces.	2hours	fifth
Monthly exam				2hours	sixth

Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Three: Central Forces and Earth's Acceleration	The student will be ي able to describe and understand displacement, velocity and angular acceleration.	2hours	seventh
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Four: Work, Kinetic Energy and Potential Energy	The student will be able to describe and understand the nature of work, potential energy, and kinetic energy of objects, in addition to the law of conservation of energy.	2hours	egith
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Five: Linear Momentum	The student will be able to describe and understand the laws of conservation of momentum, center of mass, and collisions.	2hours	Ninth
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter 6: Moments and Angular Momentum	The student will be able to describe and understand the moments and angular momentum of objects of different shapes and sizes.	2hours	tenth
Weekly exams	1- Paper lectures 2- Electronic screen	Simple	First aid methods	2hours	eleventh
Monthly exam				2hours	

11. Infrastructure	
-Resources1- Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008. 2- F.Sears, Addison-Wesley publishing company , Optics 1964. 3- F.Jenkins& H.White, Fudamentals of Optics by , McGraw Hill book company,4th edition ,1985.	Required readings: □ Basic texts □ Course books □ Other ▪
There are sites to display explanatory videos that have been downloaded with electronic links on the YouTube program for the relevant subject teacher (Assistant Professor Dr. Ali Hassan Khader) to explain with explanatory videos for the entire academic semesters..... In addition to downloading the material with a video explanation inside the electronic classes.	Special requirements (including, for example, workshops, periodicals, software, and websites)
	Social services (including, for example, guest lectures, vocational training, and field studies)

Course Description / Earth Science I

	This course description provides an introduction to the basic concepts of general geology and knowledge of the most important branches of geology, the rocks and layers of which they are composed, and the processes that occur on them over time..
University of Baghdad - College of Science	. 1Educational Institution
Department of Earth Science	.2 University Department / Center
General Geology **105 GS /**-1-	. 3Course name/code
Weekly	. 4. Available forms of attendance
First semester / 2023-2022	.5.Semester/Year

6. Number of study hours (total)	2 hours hours30=15 x
. 7. Date of preparation of this description	1/9/2022
8. Course objectives	
To make the student familiar with the basic concepts of general geology and to know the most important branches of geology, the rocks and layers of which they are composed, and the processes that occur on them over time.	

9. Learning outcomes, teaching, learning and assessment methods.
A- Cognitive objectives 1- Knowing the basic concepts of general geology 2- Knowing the most important branches of geology 3- Identifying the most important applied aspects of geology 4- Knowing the types of rocks in nature. 5- The role of geology with other sciences 6- Its role in exploring hydrocarbons
B - Skill Objectives B1- Knowing the student's skill style. B2- Developing the student's mental skills B3- Trying to make the student interact with the material positively B4- Developing intellectual and objective activities among students.

Course Description / Mathematics I

. 1Educational Institution	University of Baghdad
	This course description provides the student with the basic concepts in mathematics and knowledge of some important laws that he uses in other subjects.

2.Scientific Department/Center	Faculty of Science - Department of Mathematics
3. Course name/code	mathematics **106 M** /-**1**-
4. Available forms of attendance	Weekly
.5 Semester / Year	First semester –2022-2023
.6 Number of study hours (total)	2 hours30 = 15 x hours
.7 Date this description was prepared	1/9/2022
8. Course objectives To make the student familiar with the basic concepts in mathematics and know some important laws that he uses in other subjects	

9. Course outcomes, teaching, learning and assessment methods.
A- Cognitive objectives A1- Knowing the basic concepts in mathematics A2- Knowing some laws and their applications A3- Identifying the most important topics in mathematics with illustrative examples A4- A5- A6-
C- Thinking skills A1- Give students a number of external questions as homework and give them the opportunity to think and find solutions. A2- Encourage students to conduct reports and research on the subjects they study and use modern technologies in research and develop their research skills such as the Internet.
Teaching and learning methods

1. Using the Google Class platform .1 2. Preparing daily reports and assignments .2 3. Using YouTube explanatory videos .3
Evaluation methods
Daily tests and discussions .1 Reports and homework .2 Monthly tests .3
Teaching and learning methods
• Clarifying the scientific material through multiple examples, creating paper lectures, and using Power Point technology to explain solutions and applications. • Continuously benefiting from the World Wide Web (Internet) unit by displaying videos related to the topic
Evaluation methods
• Conducting short surprise exams so that the student is aware and continuously reading the lectures on the scientific material. • • Conducting continuous monthly exams and evaluating the reports and research required from the student.
D- General and transferable skills (other skills related to employability and personal development). D1- Giving some intellectual questions to encourage the student to use the resources and library D2- Using the Internet for the purpose of increasing knowledge D3- D4-

The student is evaluated through daily and monthly exams and interaction during lectures. In addition to holding courses and discussion and study groups between the student and the professor

in the department, which in turn plays a major role in raising awareness and scientific advancement for all students.
D- General and transferable skills (other skills related to employability and personal development). D1- Practicing the scientific method D2- Practicing creative thinking D3- Practicing daily activities D4- Practicing daily tests

10. Course structure					
Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	Week
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	SLOP		2hours	1
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	DOMAIN ,RANGE		2hours	2
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	TYPES OF FUNCTIONS		2hours	3
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	LIMIT		2hours	4
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	CONTINOUS FUNCTIONS		2hours	5
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	TRIGONOMETRIC FUNCTIONS		2hours	6
Monthly and daily exam and interaction		DERIVATIVES		2hours	7

within the lecture					
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	IMPLICIT DIFFERENTIATION		2hours	8
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	APPLICATION OF DERIVATIVES		2hours	9
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform	INDEFINITE INTEGRAL		2hours	10
Monthly and daily exam and interaction within the lecture	Use the Google Meet and YouTube platform				11

CALCULUS MATH	• Required textbooks ●
CALCULUS MATH	• Main references (sources) ●
	• Recommended books and references (scientific journals, reports, etc.) ●
	• Electronic references, websites, etc. ●
.11 Curriculum Development Plan	

Course Description / Chemical Safety and Security

This course description provides identification and knowledge of the specifications of the environment (laboratory) in which he works, including the types of risks he deals with daily and their source, and working confidently while conducting his experiments and preparations after learning the correct application of safety and security rules, as well as the proper and correct handling of chemicals, tools and devices used in the laboratory to avoid injuries.

University of Baghdad / College of Science	1. Educational institution
Department of Chemistry	.2 University Department / Center
Chemical Safety and Security / **109 ChAC**	3. Course name/code
Weekly	4. Available forms of attendance
First semester 2022-2023	.5.Semester/Year
2 hours30 = 15 x hours	.6. Number of study hours (total)

1/9/2022	.7. Date of preparation of this description
8. Course objectives	
The aim of teaching the chemical safety and security subject to first-year students is to prepare students who are able to identify and know the specifications of the environment (laboratory) in which they work, including the types of risks they deal with daily and their source, and to work confidently while conducting their experiments and preparations after learning the correct application of safety and security rules, as well as the proper and correct handling of chemicals, tools and devices used in the laboratory to avoid injuries.	

9. Learning outcomes, teaching, learning and assessment methods.
A- Cognitive objectives A1- Providing students with knowledge of good specifications for the laboratory in which they work. A2- Acquiring knowledge of the correct application of safety and security rules in laboratories.
B - Skill objectives B1 - Teaching the student how to deal with the materials and glassware in the laboratory. B2 - Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation within the lecture.
Teaching and learning methods
• Clarifying the scientific material through multiple examples, creating paper lectures, and using Power Point technology to explain solutions and applications. • • Continuously benefiting from the World Wide Web (Internet) unit by displaying videos related to the topic.
Evaluation methods

• Conducting short surprise exams so that the student is aware and continuously reading the lectures on the scientific material. • • Conducting continuous monthly exams and evaluating the reports and research required from the student.
C- Emotional and value-based objectives C1- Giving students a number of external questions as homework and giving them the opportunity to think and find solutions. C2- Motivating students to conduct reports and research on the subjects they study and use modern technologies in research and develop their research skills such as the Internet.
Teaching and learning methods
It is noted that our dear students are aware and conscious that they are undergraduate students and are committed to reading, attending lectures, taking monthly and short exams, and are committed to university laws and regulations.
Evaluation methods
- Holding some courses and seminars in the department has a major role in educating our dear students and constructive discussion between the student and the professor. - The distinguished students scientifically and those participating in the seminars held in the College of Science are evaluated and rewarded.
D- General and transferable skills (other skills related to employability and personal development). D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them. D2- Developing personal skills by reciting poetry debates through their participation in central celebrations held within the university.

11. Course structure

Evaluation method	Teaching method	Name of unit/course or topic	Required learning outcomes	hours	Week
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter One: General Safety Precautions in	The student will be able to describe general safety	2 hours	1

		Chemical Laboratories	precautions in chemical laboratories.		
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter One: General Safety Precautions in Chemical Laboratories	The student will be able to describe general safety precautions in chemical laboratories.	2 hours	2
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Two: Hazards and Injuries in Chemical Laboratories	The student will be able to describe hazards and injuries in chemical laboratories.	2 hours	3
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Three: Special Precautions for Experiments Requiring Heating	The student will be able to describe precautions for experiments requiring heating.	2 hours	4

Course Description / Chemical Safety and Security

This course description provides identification and knowledge of the specifications of the environment (laboratory) in which he works, including the types of risks he deals with daily and their source, and working confidently while conducting his experiments and preparations after learning the correct application of safety and security rules, as well as the proper and correct handling of chemicals, tools and devices used in the laboratory to avoid injuries.

University of Baghdad / College of Science	1. Educational institution
Department of Chemistry	.2 University Department / Center
Chemical Safety and Security / **109 ChAC**	3. Course name/code
Weekly	4. Available forms of attendance
First semester 2023-2022	.5.Semester/Year
2 hours 30= 15 x hours	.6. Number of study hours (total)
1/9/2022	.7. Date of preparation of this description
. 8. Course objectives	
The aim of teaching the chemical safety and security subject to first-year students is to prepare students who are able to identify and know the specifications of the environment (laboratory) in which they work, including the types of risks they deal with daily and their source, and to work confidently while conducting their experiments and preparations after learning the correct application of safety and security rules, as well as the proper and correct handling of chemicals, tools and devices used in the laboratory to avoid injuries.	

9. Learning outcomes, teaching, learning and assessment methods.

A- Cognitive objectives A1- Providing students with knowledge of good specifications for the laboratory in which they work. A2- Acquiring knowledge of the correct application of safety and security rules in laboratories.
B - Skill objectives B1 - Teaching the student how to deal with the materials and glassware in the laboratory. B2 - Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation within the lecture.
Teaching and learning methods
• Clarifying the scientific material through multiple examples, creating paper lectures, and using Power Point technology to explain solutions and applications. • • Continuously benefiting from the World Wide Web (Internet) unit by displaying videos related to the topic.
Evaluation methods
• Conducting short surprise exams so that the student is aware and continuously reading the lectures on the scientific material. • • Conducting continuous monthly exams and evaluating the reports and research required from the student.
C- Emotional and value-based objectives C1- Giving students a number of external questions as homework and giving them the opportunity to think and find solutions. C2- Motivating students to conduct reports and research on the subjects they study and use modern technologies in research and develop their research skills such as the Internet.
Teaching and learning methods
It is noted that our dear students are aware and conscious that they are undergraduate students and are committed to reading, attending lectures,

taking monthly and short exams, and are committed to university laws and regulations.
Evaluation methods
- Holding some courses and seminars in the department has a major role in educating our dear students and constructive discussion between the student and the professor. - The distinguished students scientifically and those participating in the seminars held in the College of Science are evaluated and rewarded.
D- General and transferable skills (other skills related to employability and personal development). D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them. D2- Developing personal skills by reciting poetry debates through their participation in central celebrations held within the university.

11. Course structure

Evaluation method	Teaching method	Name of unit/course or topic	Required learning outcomes	hours	week
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter One: General Safety Precautions in Chemical Laboratories	The student will be able to describe general safety precautions in chemical laboratories.	2 hours	1
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter One: General Safety Precautions in Chemical Laboratories	The student will be able to describe general safety precautions in chemical laboratories.	2 hours	2
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Two: Hazards and Injuries in Chemical Laboratories	The student will be able to describe hazards and injuries in chemical laboratories.	2 hours	3
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Three: Special Precautions for Experiments	The student will be able to describe precautions for experiments requiring heating.	2 hours	4

		Requiring Heating			
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Four: Safety Precautions When Handling Glassware	The student will be able to describe safety precautions when handling glassware.	2 hours	5
Monthly exams	1- Paper lectures 2- Electronic screen			2 hours	6
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Five: Safety Precautions When Handling Compressed Gas Cylinders	The student will be able to describe safety precautions when handling compressed gas cylinders.	2 hours	7
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Six: Safety Precautions After Completing Laboratory Work	The student will be able to describe safety precautions after completing laboratory work.	2 hours	8
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Seven: Safety Precautions When Storing and Preserving Chemicals	The student will be able to describe safety precautions when storing and preserving chemicals.	2 hours	9
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Eight: Types of Fires and Means of Extinguishing Them	The student will be able to describe the types of fires and the means of extinguishing them.	2 hours	10
Weekly exams	1- Paper lectures 2- Electronic screen	Chapter Nine: First Aid	The student will be able to describe first aid methods.	2 hours	11
Monthly exam				2 hours	12

Course Description Form

12.Infrastructure	
Required readings: Basic texts Course books Other ▪	**-Sources** **- Safety in Chemical Laboratories** **Kingdom of Saudi Arabia** **General Organization for Vocational and Technical Rehabilitation** **General Administration for Curriculum Design and Development**
Special requirements (including, for example, workshops, periodicals, software, and websites)	There are websites that display explanatory videos on how to use the chemicals and glassware necessary to complete the requirements of any experiment in the laboratory.
Social services (including, for example, guest lectures, vocational training, and field studies)	

For the first stage

Second semester

2022-2023

Course Description / Analytical Chemistry 2

This course description provides a comprehensive study of volumetric analysis and types of calibrations, leading to how to calculate the hydrogen function of acids, bases, salts of all types, and buffers of all types.

1. Educational institution	University of Baghdad / College of Science
2. University Department/Center	Department of Chemistry
3. Course Name/Code	Analytical Chemistry (2) **108 ChSS**/
4. Available forms of attendance	Weekly
5. Semester/Year	Second semester / 2022-2023
6. Number of study hours (total)	2 hours 30= 15 x hours

1/9/2022	.7 Date this description was prepared

.8 Course Objectives

The aim of teaching theoretical analytical chemistry for the first stage/second semester is a comprehensive study of volumetric analysis and types of titrations, arriving at how to calculate the hydrogen function of acids, bases, salts of all types, and buffers of all types.

.9 Learning outcomes, teaching and learning methods and assessment

A- Cognitive objectives

A1- Identify the methods of preparing different chemical materials and using them in analytical chemistry.

A2- Identify acid-base corrections, types of indicators, and how to choose the appropriate indicator.

A3- Identify how to calculate the hydrogen function for all types (acids, bases, salts, and phosphates).

A4- Identify the method of finding the concentration of materials in normal units and parts per million.

5A- Identify standard and non-standard materials and how to prepare them.

B - Course specific skill objectives

B1- Teaching the student how to use laboratory equipment and prepare and use materials.

B2- How to write reports and summarize and discuss the results obtained from the experiment.

B3- Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation in standing in front of the board to solve some mathematical and statistical problems.

B4- Teaching the student to benefit from the Internet to extract research and summarized reports on the prescribed practical material

Teaching and learning methods

- Clarifying the scientific material through approved analytical books and creating paper lectures to clarify the mechanisms used and some of the mechanisms of the interactions under study.
- Creating an electronic class and a channel on the Telegram website.

- Suggested discussion within the lecture.
- Continuous use of the World Wide Web (Internet).

Evaluation methods

- Conducting short surprise exams every week so that the student is aware and continuously reading the curriculum.
- Conducting monthly exams and evaluating external reports and research required from the student.
- Conducting electronic tests.

C- Emotional and value-based objectives

C1- The ability to draw conclusions and suggest external questions and issues that expand the student's thinking.

D- General and transferable qualification skills (other skills related to employability and personal development).

D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them.

D2- Developing personal skills through scientific trips to sites specialized in chemical transactions.

Course Structure .10

Evaluation method	Teaching method	Name of unit/course or topic	Required learning outcomes	hours	week
Weekly exams and reports	1- Paper lectures 2- Electronic screen	introduction	chemical equilibrium	2	1
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Standard and non-standard solutions and method of preparation	Learn about the properties of standard matter and types of volumetric interactions.	2	2
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Calculating the acidity function of acids and bases	Correction curves	2	3
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Calculate the acidity function of salts	Correction curves	2	4-5
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Calculate the acidity function of the buffers	Correction curves	2	6-7
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Sedimentary correction	Correction curves	2	8
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Complex correction	Correction curves	2	9
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Blocking and unblocking	Correction curves	2	10
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Oxidation-reduction correction	Correction curves	2	11

Weekly exams and reports	1- Paper lectures 2- Electronic screen	exam	exam	2	12

Infrastructure .11	
Fundamentals of analytical chemistry /Skoog and West ,7th ed.,2000 -Fundamental of analytical chemistry by Skoog, West, Holler & Crouch, 8th , 2004.	**Required textbooks** ●
Fundamental of analytical chemistry by Skoog, West, Holler & Crouch, 8th , 2007.	**Main references (sources)** ●
	• Recommended books and references (scientific journals, reports, etc.) ●
	• Electronic references, websites ●

Curriculum Development Plan .12
Adding a part of the automated analysis to the curriculum vocabulary

Course Description / Analytical Chemistry (Practical) 2

This course description provides an introduction to descriptive and volumetric analytical chemistry. Descriptive chemistry relies on describing a colorimetric or sedimentary method to determine the type of unknown ion, while volumetric chemistry relies on measuring the volumes of a substance equivalent to the substance of unknown concentration within titration processes and determining the unknown concentration.	
University of Baghdad / College of Science	**1. Educational institution**
Department of Chemistry	**2. Scientific Department / Center**
Practical analytical chemistry (1) **110 ChAC/**	**3.Course Name/Code**
Weekly	**4. Available forms of attendance**
Second semester / 2022-2023	**5.Semester/Year**
4 hours 60= 15 x hours	**6. Number of study hours (total)**
1/9/2022	**7. Date of preparation of this description**
	8. Course objectives
The aim of teaching the practical analytical chemistry course for the first stage second semester is to introduce students to practical experiments in descriptive and volumetric analytical chemistry. Descriptive analytical chemistry depends on describing a colorimetric or sedimentary method to determine the type of the unknown ion, while volumetric chemistry depends on measuring the volumes of a substance equivalent to the substance of unknown concentration within the titration processes and determining the unknown concentration. And processing the analytical results obtained using modern statistical analysis.	

9. Course outcomes, teaching, learning and assessment methods
A- Cognitive objectives
A1- Identify the methods of preparing different chemical materials and benefiting from them in analytical chemistry.

A2- Identify how to perform descriptive analysis and benefit from it in identifying the type of ions in different models.

A3- Identify the types of volumetric analysis and how to conduct quantitative volumetric analysis using calibration tools.

B - Course specific skill objectives

B1- Teaching the student how to use laboratory equipment and prepare and use materials.

B2- How to write reports and summarize and discuss the results obtained from the experiment.

B3- Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation in standing in front of the board to solve some mathematical and statistical problems.

B4- Teaching the student to benefit from the Internet to extract research and summarized reports on the material

Teaching and learning methods

- Clarifying the scientific material through approved analytical books, creating paper lectures, and using Power Point technology to clarify the mechanisms used and some of the mechanisms of the interactions under study.
- Using Google Classroom to display lectures in the form of audio and video recordings.
- Proposed discussion within the lecture and in the electronic class.
- Continuous use of the World Wide Web (Internet).

Evaluation methods

- Conducting short surprise exams every week so that the student is aware and continuously reading the experiments related to the course.
- Conducting weekly exams using Google forms
- Evaluating the weekly reports submitted by the student after conducting the scientific experiment.
-
- Conducting monthly exams and evaluating external reports and research required from the student in the electronic class Google classroom

C- Emotional and value objectives

C1- The ability to deduce and suggest methods for estimating positive and negative ions based on volumetric analysis methods.

C2- Developing skills related to suggesting methods for separating and estimating different ions in various sources
D- General and transferable skills (other skills related to employability and personal development). **D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them.** **D2- Developing personal skills through scientific trips to sites specialized in chemical transactions.**

10. Course structure

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	week
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Laboratory Instructions and Glassware Identification	Review laboratory tools and equipment and how to use them	2	1
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Preparation and titration of HCl acid	How to prepare diluted acids from concentrated acids	2	2
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Quantitative determination of sodium carbonate	Volumetric analysis for the determination of sodium carbonate using HCl acid	2	3
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Analysis of a mixture of sodium carbonate	Use of volumetric analysis to estimate sodium carbonate in a mixture	2	4
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Analysis of a mixture of sodium carbonate and sodium hydroxide	Use of volumetric analysis to determine sodium carbonate and sodium hydroxide in a mixture	2	5
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Analysis of a mixture of sodium carbonate and sodium bicarbonate	Use of volumetric analysis to determine sodium carbonate and sodium bicarbonate in a mixture	2	6
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Quantitative determination of chloride ion by Moore's method	Learn Moore's method for the determination of chloride ions in solutions.	2	7
Weekly exams and reports	1- Paper lectures 2-	Quantitative determination of iron(II) ions using	Identify oxidation-reduction corrections	2	8

	Electronic screen	oxidation-reduction assays	and estimate iron(II) ions.		
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Quantitative estimation of water hardness	Estimation of total and final water hardness based on analysis using complex calibrations	2	9

	11. Infrastructure
Fundamentals of analytical chemistry /Skoog and West ,7th ed.,2000 -Fundamental of analytical chemistry by Skoog, West, Holler & Crouch, 8th , 2004.	• **Required textbooks** •
	• **Main references (sources)** •
	• **Recommended books and references (scientific journals, reports, etc.)** •
	• **Electronic references, websites** •

12 .. Curriculum Development Plan
Update and add new experiences to the course

Course Description / Inorganic Chemistry 2

This course description provides the study of covalent compounds, the study of Lewis theory, molecular orbital theory, electron pair repulsion theory, hybridization, the study of hydrogen, the alkali group of elements, the alkaline earth group of elements, the boron group, and the carbon group.	
University of Baghdad	.1 Educational institution
Department of Chemistry	.2 University Department/Center
inorganic chemistry (2) **111 ChIC/**	.3 Course Name/Code
Weekly	.4 Available forms of attendance
Second semester /2022-2023	.5 Semester/Year
2 hours 30= 15 x hours	.6 Number of study hours (total))
1/9/2022	.7 Date this description was prepared
	.8 Course Objectives

The aim of teaching Inorganic Chemistry (2) for the first stage / second semester is to Study covalent compounds Study Lewis theory Molecular orbital theory Electron pair repulsion theory Hybridization Study hydrogen Alkali group Alkaline earth group Boron group arbon group

9. Learning outcomes, teaching and learning methods and assessment
A- Cognitive objectives A1- Study covalent compounds and how they are linked together A2- Study bonding theories for the purpose of arriving at the geometric shapes of chemical compoundsA3- Study of hybridization A4- Study of some elements of the periodic table and know their properties and reactions
B - Course specific skills objectives B1 - Teaching the student to benefit from the Internet unit to extract research and summary reports on the prescribed practical material B2 - Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation in standing in front of the board to solve some mathematical and statistical problems
Teaching and learning methods
• Using the Google Class platform ● • Preparing reports and homework ● • Using YouTube explanatory videos ● Using explanatory tools and asking inferential questions ●
Evaluation methods

- Conducting short surprise exams so that the student is aware and continuously reading the lectures on the scientific material.
-
- Conducting continuous monthly exams and evaluating the reports and research required from the student.

C- Emotional and value-based goals

A1- The relationship between the student and the professor must be a social and emotional relationship, and within permissible limits, respect and prestige of the professor must always remain.

A2- It is necessary to listen to the students' problems and strive to solve them.

A3- Directing the students to adhere to the instructions inside the hall and in the examination halls and to adhere to the university's regulations and laws and to adhere to the uniform.

Teaching and learning methods

It is noted that our dear students are aware and conscious that they are undergraduate students and are committed to reading, attending lectures, taking monthly and short exams, and are committed to university laws and regulations.

Evaluation methods

- Holding some courses and seminars in the department has a major role in educating our dear students and constructive discussion between the student and the professor.
- Scientifically distinguished students and participants in seminars held in the College of Science are evaluated and rewarded.
- Holding scientific trips to some factories to learn about the production stages.

D- General and transferable skills (other skills related to employability and personal development).

D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them.

D2- Developing personal skills by reciting poetry debates through their participation in central celebrations held within the university

Course Structure .10

Evaluation method	Teaching method	Name of unit/cou	Requir ed	hours	week

		rse or topic	learning outcomes		
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	Covalent compounds		2	1
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	Lewis theory		2	2
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	Molecular orbital theory		2	3
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	Electron pair repulsion theory		2	4-5
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	Equivalence bond theory		2	6-7
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	First month exam		2	8
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	Hydrogen Chemistry		2	9
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	Alkaline elements		2	10
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	alkaline earth elements		2	11
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	boron chemistry		2	12-13
Monthly exam, daily exam and discussion within the lecture	1- Paper -1 lectures 2- Blackboard -2	carbon		2	الرابع عشر و الخامس عشر

Infrastructure .11	
-Basic InOrganic chemistry by F.A.Cotton & G.Wilkinson.	Required textbooks -1
1-Inorganic chemistry by G.E.Huheey 2 Inorganic Chemistry for the first stage	Main references (sources) -2

12. Curriculum development plan

The increasing use of information technology, the extraction of reliable e-books, and the updating of vocabulary and curricula to ensure keeping pace with the great development in the world of technology.

Course Description / Mathematics -2-

This course description provides methods of differentiation, integration, and other information such as polar coordinates, sequences, series, and other topics.

University of Baghdad / College of Science	1. Educational institution

Department of Mathematics	2.Scientific Department/Center
Calculus (2) / **115 M**	3. Course name/code
Weekly	4. Available forms of attendance
First stage / second semester / 2022-2023	.5 Semester / Year
3 hours 45 = 15 x hours	.6 Number of study hours (total)
1/9/2022	.7 Date this description was prepared
8. Course objectives	
• Introducing the student to the methods of derivation and integration and other information, such as polar coordinates, sequences, series, and other topics. ●	
• The course aims to provide the student with a new background that he can benefit from when studying differential equations. ●	

9. Course outcomes, teaching, learning and assessment methods.
A- Cognitive objectives A1- Learn the basic concepts of conic sections and coordinates A2- Give the student experience in graphs with polar coordinates A3- Learn about sequences, the mechanism of convergence and divergence, series and methods of testing them A4- Gain sufficient experience about differentiation and integration of some special functions
B - Course specific skill objectives. B1 - Scientific reports B2 – Research
Teaching and learning methods
- Daily surprise tests and continuous weekly tests. - Training and activities in the classroom.

- Guiding students to some sources that contain examples and exercises to benefit from them.
Evaluation methods
- Participation in the classroom - Presentation of activities - Midterm and final exams and activities
C- Emotional and value-based objectives C1- Developing the student's ability to work on completing assignments and submitting them on time. C2- Trying to apply the concepts by solving different types of exercises. C3- Developing the student's ability to dialogue and discuss.
Teaching and learning methods
• Managing the lecture in a practical manner related to the reality of daily life to attract the student to the subject of the lesson without straying from the core of the subject so that the material is flexible and capable of being understood and analyzed. • Assigning the student some group activities and assignments. ● • Allocating a percentage of the grade for daily assignments and tests. ●
Evaluation methods
• Active participation in the classroom is evidence of the student's commitment and responsibility. ● • Commitment to the deadline for submitting assignments and research. ● • Midterm and final exams express commitment and knowledge and skill attainment. ● • Daily applications, exercises and assignments. ●
D- General and transferable skills (other skills related to employability and personal development). D1- Developing the student's ability to deal with technology. D2- Developing the student's ability to deal with the Internet. D3- Developing the student's ability to deal with multimedia. D4- Developing the student's ability to dialogue and discuss

Course Structure.10					
Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	Week
General questions and discussion	theoretical	Integration	Properties of integrals	4	1
General questions and discussion	theoretical	Integration	First fundamental theorem and the second for the calculus indefinite	4	2
General questions and discussion	theoretical	Integration	*Integration* by substitution	4	3
General duties	theoretical	The calculus of transcendental functions	A function natural logarithm	4	4
instant test	theoretical	The calculus of transcendental functions	Exponential functions	4	5
General questions and discussion	theoretical	The calculus of transcendental functions	Hyperbolic functions,	4	6
General duties	theoretical	The calculus of transcendental functions	Inverse hyperbolic functions	4	7
instant test	theoretical	Method of integration	Integration trigonometric functions	4	8
General questions and discussion	theoretical	Methods of integration	Applications of definite	4	9
Monthly exam	theoretical	- Methods of integration	integrals, Integration on infinite periods-	4	10

General questions and discussion	theoretical	Methods of integration	Test nth term for divergence series	4	11
General duties	theoretical	Sequences and series	Definitions of Sequences and series	4	12
instant test	theoretical	Sequences and series	Test nth term for divergence series	4	13
General questions and discussion	theoretical	Polar coordinates	Polar coordinates, the relationship between polar and Cartesian coordinates	4	14
General questions and discussion	theoretical	Polar coordinates	Line and circle and cone coordinates polar equation	4	15

Infrastructure.11	
Required Textbooks -1	• Differential Calculus "Dr. Basil Al-Hashemi". • • Differential Calculus Schaum Series.
(Main References (Sources -2	Calculus and Analytic Geometric , Durfee . W.H , 1971 New Yor k • Calculus and Analytical Geometry, Purcell A.J., (3) Translated by Ali Aziz Ali and others, parts one and two 1983 University of Mosul – Iraq
A- Recommended books and references (scientific journals, reports, etc.)	• The most important books and sources for calculus are available in the Central Library, the Science Library, and the Department.
B - Electronic references, websites...	• Reliable websites. (www. Freescience.info/math) • Virtual library.

• Websites of libraries in some international universities. ●	

Curriculum Development Plan.12
● Periodically review the latest books and research on the subject of differential and integral calculus and include them in the plan.

Course Description Form

For the Second stage

First Semester

2022-2023

Course Description / Analytical Chemistry - 3-

This course description provides an introduction to the basics of gravimetric analytical chemistry, types of precipitating agents, properties of precipitates and precipitating agents, advantages and disadvantages of gravimetric analysis and its applications in analytical chemistry, explanation of types of organic and inorganic reagents and homogeneous precipitation.	
University of Baghdad / College of Science	**Educational institution** .1
Department of Chemistry	**Scientific Department / Center** .2
Analytical Chemistry (3) **218 ChAC/**	**Course Name/Code** .3
Weekly	**Available forms of attendance** .4
first/ 2023-2022	**Semester/Year** .5
2 1 hour 30= 15 x hours	**6. Number of study hours (total)** .6
1/9/2022	**7. Date this description was prepared** .7
	Course Objectives .8
1. Teaching Analytical Chemistry for the second stage / first semester of the Chemistry Department	
2. Identify the basics of analytical chemistry, types of precipitating agents, properties of precipitates and precipitating agents	
3. Advantages and disadvantages of gravimetric analysis and its applications in analytical chemistry	
4. Explain the types of organic and inorganic reagents and homogeneous precipitation	
5. Introduction to thermal analysis, types of thermal sensors, thermal analysis conditions and how to deal with the sample	
6. Practical and theoretical applications of thermal analysis in chemistry	
7. Introduction to statistical analysis, including an explanation of statistical equations and calculations related to analytical chemistry	
9. Applications of statistical analysis equations in volumetric and gravimetric analysis, as well as calculations associated with all analytical chemistry techniques	

Course outcomes, teaching, learning and assessment methods .9	
A- Cognitive objectives	

A1- To achieve a good understanding of the study content of weight analysis and thermal analysis

A2- To teach students and prepare them to understand the theoretical foundations and the extent of convergence between the theoretical material

A3- To teach students to refer to sources for solutions to exercises and questions related to the lecture topic

A4- To encourage students and instill confidence in them on the principle of dialogue and useful discussion.

A5- To allow students to suggest new methods and ideas that help them understand difficult topics

B - Course specific skill objectives

B1 - The ability to find solutions and derive ideas for various issues and solutions to questions

B2 - Follow up on students and encourage them to read through electronic and video meetings

B3 - Teaching students and urging them to use important electronic programs that facilitate their understanding of the material

B4 - Seeking to enable students to apply and use electronic programs that facilitate the process of conducting electronic exams

Teaching and learning methods

Applying e-learning methods to facilitate the task of teaching students and their understanding of the material, which includes video and audio lectures such as SCREEN RECORDER, attaching audio and video files to the Google class room program, and using electronic programs to meet students directly such as Google Meet, ZOOM, FCC,.

Evaluation methods

The subject is evaluated through

• Conducting surprise short exams (Quiz) to make the student aware and continuously read the lectures on the scientific subject.
• Giving homework Assignments
• Encouraging students to submit reports related to the topics of the course and their applications in analytical chemistry
• Conducting continuous monthly exams •

C- Emotional and value-based objectives

C1 The student understands the university behavior that must be demonstrated

C2- Spreading the spirit of cooperation among students, such as the learner providing assistance to his friends in the classroom

C3- Developing some interests and hobbies among students

C4- Helping students to do group work in the classroom

Teaching and learning methods

Applying e-learning methods to facilitate the task of teaching students and their understanding of the material, which includes video and audio lectures such as SCREEN RECORDER, attaching audio and video files to the Google Classroom program, and using electronic programs to meet students directly such as Google Meet, ZOOM, FCC, .

Evaluation methods

i. Conducting surprise short exams (Quiz) to keep the student aware and continuously reading the lectures on the scientific material.

ii. Giving homework Assignments

D - General and transferable qualification skills (other skills related to employability and personal development).

D1- Working on developing a distinguished personality for the student by developing cultural and social awareness, which qualifies him after graduation to serve the community

D2- - Working on creating a suitable scientific environment to prepare highly specialized cadres while developing their scientific and practical capabilities

D3- Communicating with graduate students to know the lessons they have benefited from in their field of work to work on developing the vocabulary of these lessons

D4- Using the sources and terms specific to the course

Course Structure .10

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	Hours	Week
Short exams, monthly exams and oral discussions	Electronic - Visual video lectures Using Google Classroom And lectures in PDF format	Gravimetric analysis	Gravimetric methods, Precipitation, & Volatilization Electrogravimetry, Properties of Precipitates and Precipitating Reagents	2	1
		Gravimetric analysis steps	Steps of Gravimetric Analysis Particle size and filterability of precipitates, Factors that Determine the Particle Size of Precipitates Colloidal & Crystal suspensions	2	2
		Mechanics of deposition	Mechanism of Precipitate Formation (nucleation and particle growth) Colloidal Precipitates, Coagulation of Colloids. Factors which determine the nature of the adsorbed counter ion	2	3
		Types of sediments formed and characteristics of sediments	Coagulation, Peptization of Colloids, Crystalline Precipitates Methods of Improving Particle Size and Filterability Post-precipitation, Re-precipitation, Occlusion, Co-precipitation	2	4
		Precipitation from homogeneous solutions, applications of gravimetric analysis and a	Precipitation from Homogeneous Solution, Digestion of the Precipitate, Washing the Precipitate, Drying and Ignition Advantages and disadvantages of the gravimetriric methods	2	5

		comprehensive description of the types of reagents used as precipitating agents.	Applications of Gravimetric methods, Inorganic Precipitating Agents, Reducing Agents, Organic Precipitating Agents Principles and calculation of Gravimetric factor		
First semester exam					6
Short exams, monthly exams and oral discussions	**Electronic - Visual video lectures Using Google Classroom And lectures in PDF format**	Thermal Analysis Basics	Principles of Thermogravimetry, Thermogravimetry analysis, Differential Thermal Analysis, Differential scanning calorimetry, Advantages and Disadvantages of Thermal Analysis	**2**	7
		Thermal analysis classification	Derivative thermogravimetrv, curve, Uses of TGA in Analytical Chemistry, TGA thermogram for some compounds in an inert atmosphere, Factors affecting the shape of thermogravimetric curves	**2**	8
		Factors affecting thermal analysis	Differential Thermal Analysis, Formalized DTA curve, or heat flux instrumentation, Applications of DTA, Transitions through DTA analysis of an organic polymer, Factors affecting the shape of DTA curves, Microthermal analysis **Principles and Calculation of KSP**	**2**	9
		Statistical analysis	Statistical Analysis, Errors in Analytical Measurements, Measurement errors, Absolute and relative errors, Determinate error, Indeterminate errors, Accumulated error	**2**	10
		Accuracy, precision and standard deviation Accuracy, precision and	Assessment of Accuracy and Precision, Accuracy Precision, Standard deviation, Relative standard Deviation, Variance, Overall precision, Confidence interval	**2**	11

		standard deviation			
		Statistical analysis of a set of data and different experiments	Significance Testing, Significance tests Outliers, Q-test, F-test, t-test, Analysis of variance	**2**	12
		Standard curve and related analytical data	Calibration and Linear Regression, Calibration, Correlation coefficient, Linear regression, Limit of detection, Standard addition, Internal standardization, Internal normalization	**2**	13
Second semester exam					14

Infrastructure .11	
Fundamentals of Analytical Chemistry 9th Edition (Douglas A. Skoog) Lecture Notes on Grvimetric analysis	• **Required textbooks** •
*Practical Statistics for the Analytical Scientist, A Bench Guide2nd Edition *Analytical Chemistry Theoretical and Metrological Fundamentals	• **Main references (sources)** •
INSTANT NOTES of Analytical Chemistry (D. Kealey)	• **Recommended books and references (scientific journals, reports, etc.)** •
https://byjus.com/chemistry/gravimetric-analysis/ **https://link.springer.com/chapter/10.1007/978-981-15-1547-7_16**	• **Electronic references, websites** •

Curriculum Development Plan .12
- Adding illustrative means and including some illustrative images and educational videos related to the lecture topic **- Using electronic simulation of some typical videos published on sites such as YouTube and others and benefiting from the global experiences that preceded the use of e-learning and blended learning** **blended and electronic lear** **ing)**

Course Description / Analytical Chemistry (Practical) - 2-

This course description introduces students to gravimetric analytical chemistry experiments that depend on measuring the weight of the unknown substance and studying precipitation reactions in homogeneous solutions and the advantages of this precipitation in obtaining large crystals, with high purity and ideal properties compared to conventional precipitation.	
University of Baghdad / College of Science	**Educational institution** .1
Department of Chemistry	**Scientific Department / Center** .2
Gravimetric analytical chemistry and practical separation methods (2) **219 ChPsT**	**Course Name/Code** .3
weekly	**Available forms of attendance** .4
First semester / 2023-2022	**Semester/Year** .5
4 hours 60= 15 x hours	**Number of study hours (total)** .6

1/9/2022	**Date this description was prepared** .7

Course Objectives .8

The aim of teaching the practical analytical chemistry course for the second stage - morning / first semester is to introduce students to the experiments of analytical chemistry that depend on measuring the weight of the unknown substance and studying the precipitation reactions in homogeneous solutions and the advantages of this precipitation in obtaining large crystals, with high purity and ideal properties compared to the usual precipitation.

As for the aim of studying separation methods, it is to introduce students to the experiments of modern separation methods (chromatography) and how to separate a component from a group of components and study the practical conditions to increase analytical selectivity by estimation and its applications in analytical chemistry.

An electronic class was also created within the Google Classroom program and a class was also created in the form of a channel within the Telegram application for ease of communication and speed of access to files for each student

Course outcomes, teaching, learning and assessment methods .9

A- Cognitive objectives

A1- Identifying methods of preparing different chemical materials and using them in analytical chemistry. A2- Identify how chemical precipitation occurs and how to use it in analyzing different models.

A3- Identify the advantages of precipitation from homogeneous solutions compared to normal precipitation

A4- Identify the types of precipitating agents and the types and shapes of sediments

A5- Identify modern separation methods and use them in separating dyes and other chemical materials

B - Course specific skill objectives

B1 - Teaching the student how to use laboratory equipment and prepare and use materials.

B2 - How to write reports, summarize and discuss the results obtained from the experiment

B3 - Continuous discussion in the laboratory and asking some external questions to expand the student's understanding of the material and the student's continuous participation in standing in front of the board to solve some mathematical problems.

B4 - Urging students to benefit from the Internet to extract research and summarized reports on the prescribed practical material

Teaching and learning methods

- Clarifying the scientific material through approved books, making paper notebooks, and using Power Point technology to clarify the mechanisms used and some of the mechanisms of the interactions under study.
- Proposed discussion in the laboratory.
- Continuous use of the World Wide Web (Internet).
- Showing videos about the laboratory experiments conducted by the student
- Creating an electronic class within the Google Classroom program, and also creating a class in the form of a channel within the Telegram application for ease of communication and speed of access to files for each student and for the purpose of discussing the topic of the lesson

Evaluation methods

- Conducting short surprise exams every week so that the student is aware and continuously reading the experiments related to the course.
- Evaluating the weekly reports submitted by the student when conducting the scientific experiment.
- Conducting monthly exams and evaluating external reports and research required from the student.

• Conducting electronic exams in the form of Google Forms in the electronic class
C- Emotional and value objectives **C1- The ability to deduce and suggest methods for estimating ions and compounds based on gravimetric analysis methods.** **C2- Developing skills related to suggesting methods for separating and estimating different compounds in various sources** **C3- It is necessary to listen to students' problems and strive to solve them** **C4- Directing students to commit to attendance in the laboratory and in the electronic classroom**
Teaching and learning methods
Finding motivating questions for the student to make it easier for him to understand the experiment, in addition to video films of the experiments under study, and noting that our dear students are aware and conscious that they are undergraduate students and committed to reading, attending the lab, taking short exams, submitting reports, and adhering to university laws and regulations.
Evaluation methods
- Student activity in the laboratory through answering oral and written questions - Student attendance and commitment to laboratory time - Daily and semester exams - His attendance in the electronic class and his answers to electronic exams
D- General and transferable skills (other skills related to employability and personal development). **D1- Developing personal skills through scientific trips to scientific centers specializing in chemical analysis** **D2- Encouraging them to borrow scientific books from the university library to benefit from them scientifically** **D3- Encouraging students to benefit from websites in writing scientific reports.** **D4- Discussing topics in the electronic class and facilitating the delivery of the material by showing video films**

Course Structure .10

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	week

Weekly exams and reports	1- Paper lectures 2- Electronic screen	Laboratory Instructions and Glassware Identification	Review laboratory tools and equipment and how to use them	4	1
Weekly exams and reports	11- Paper lectures 2- Electronic screen 2-	Find the percentage of water of crystallization	Estimation of percentage of water of crystallization and number of water molecules in salts	4	2
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Nickel percentage estimate	Preparation of nickel dimethylglyoxime complex	4	3
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Nickel percentage estimate	Gravimetric analysis for estimating nickel percentage	4	4
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Preparation of ion exchange columns	The basis of modern separation methods (chromatography)	4	5
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Find the total capacity of the column.	Find the total capacity of the column used in the ion exchange process.	4	6
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Estimation of sulfate percentage using ion exchanger	Estimation and separation of sulfates using a positive separation column	4	7
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Paper chromatography for the separation of halides	Separation of halides using paper chromatography	4	8
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Thin layer chromatography for separation of organic dyes	Use of thin layer chromatography in the separation of organic dyes	4	9
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Chloride determination using a negative exchange column	Determination of chloride percentage based on chromatographic separation methods	4	10

Infrastructure .11	
-Fundamental of analytical chemistry by Skoog, West, Holler & Crouch, 8th , 2004.	• **Required textbooks** •

1- Fundamentals of analytical chemistry /Skoog and West ,7th ed.,2000 2-Principles of instrumental analysis by Skoog, West, Holler & Crouch, 8th, 2004.	• **Main references (sources)**
	• **Recommended books and references (scientific journals, reports, etc.)**
https://www.youtube.com/watch?v=peMyqdJ57dA.1 https://www.youtube.com/watch?v=lqnW9XRjzgY	• **Electronic references, websites**

Curriculum Development Plan .12
- The increasing use of the Internet to keep pace with developments in the field of analytical techniques **2- Benefit from published scientific research that follows modern methods of weight analysis and separation methods**

Course Description / Inorganic Chemistry - 3-

This course description provides a study of the periodic properties of the elements (lanthanum contraction, comparing the behavior of f-block and d-block elements in chemical reactions, the unique properties of the elements of the first and second periods in their chemical properties and the nature of the kamma and pi bonds compared to the rest of the elements of their group and the transition elements), the oxidation states of the elements, the types of oxides of the representative and transition elements of the periodic table, the colors and spectra of complexes.

1. Educational institution	University of Baghdad - College of Science
2. Scientific Department / Center	Department of Chemistry
3. Course Name/Code	**Inorganic Chemistry - 3** Theoretical/**220 ChIC**
4. Available forms of attendance	Weekly
5. Semester/Year	First semester / 2023-2022
6. Number of study hours (total)	2 hours30 = 15 x hours
7. Date this description was prepared	**1/9/2022**
8. Course Objectives	

Inorganic Chemistry (3) Theoretical: The course aims to study the periodic properties of elements (Lanthan contraction, comparing the behavior of f-block and d-block elements in chemical reactions, the unique properties of the elements of the first and second periods in their chemical properties and the nature of the coherence, kama and pi compared to the rest of the elements of their group and transition elements), oxidation states of elements, types of oxides for the representative and transition elements of the periodic table, colors and spectra of complexes (factors affecting the spectra of transition elements), magnetic properties (dia, para, ferro, ferrite and antiferromagnetism) and the effect of temperature on them, magnetic moment and its relationship to atomic state symbols, ESR,). Pole potential, (Latimer diagram of reduction potentials for multiple oxidation states of elements in the basic environment).

9. Course outcomes, teaching, learning and assessment methods
A- Cognitive objectives A1- The student should be able to identify the various tests to diagnose chemical compounds A2- Identify the properties of elements and their role in determining the chemical properties of compounds
B - Course specific skill objectives B1 - Identify some of the methods and experiments used to diagnose chemical compounds B2 - Identify the techniques in diagnosing chemical compounds descriptively and quantitatively
Teaching and learning methods
1- E-learning using Google Classroom 2- Using the display screen 3- Using visual aids 4- Using drawings on the board 5- Conducting scientific experiments in the laboratory 6- Preparing reports and homework
Evaluation methods
-Electronic tests 2-Putting inferential questions in the lecture and laboratory 3-Preparing reports and homework 4-Commitment to attendance
C- Emotional and value-based objectives C1- Student training C2- Student evaluation
Teaching and learning methods
- Record lectures on video and share them with students through online classes.
Evaluation methods
• Student contribution to discussions ● • Evaluation of attendance ● • Discussion of reports ●

Course Structure .10					
Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	week

Written exams and homework	**Use the display screen with writing on the white board white board**	Atomic structure of elements Properties of the periodic table	**Periodic properties of the elements, deviation of the electronic distribution in some elements from the n+ℓ rule**	2	**1**
Written exams and homework	Use the display screen with writing on the white board	Properties of the periodic table	**The unique property of the elements of the first and second periods, coordination numbers or pi bonds, diagonal interaction, comparison between d and f elements, lanthanum contraction**	2	**2**
	Use the display screen with writing on the white board		Comparison of d and f elements of inflexible contraction	2	**3**
Written exams and homework	Use the display screen with writing on the white board	Oxidation states	**Oxidation states and oxidation numbers of the represented elements, the effect of inert s electrons**	2	**4**
Written exams and homework	Use the display screen with writing on the white board	Oxidation states and oxides of elements	**Oxidation states and oxidation numbers of d,f elements Fayens' rule for oxidation states,**	2	**5**
	Use the display screen with writing on the white board		**Oxides of representative and transition elements**	2	**6**
Written exams and homework	Use the display screen with writing on the white board	Properties of color complexes	**Colors of transition element complexes and factors affecting**	2	**7**

			absorption energy, examples of Complexes and their colors		
Written exams and homework	Use the display screen with writing on the white board	Examples	**Examples of complexes and their colors**	2	**8**
Written exams and homework	Use the display screen with writing on the white board	Magnetism	**Magnetism, its types and the effect of temperature, ESR technology**	2	**9**
Written exams and homework	Use the display screen with writing on the white board	Pole potential	**Electrode potential, cell potential, relationship of cell potential to equilibrium constant and free energy, examples and problems**	2	**10**
Written exams and homework	Use the display screen with writing on the white board	Latimer chart	**Latimer diagram of multiple oxidation states in basic medium and**	2	**11**
Written exams and homework	Use the display screen with writing on the white board	Symmetry	Symmetry elements and symmetry operations	2	**12**
Written exams and homework	Use the display screen with writing on the white board	Symmetry	Symmetry elements and symmetry operations complete	2	**13**
Written exams and homework	Use the display screen with writing on the white board	Symmetry	Types of point group	2	**14**
Written exams and homework	Use the display screen with writing on the white board	Solid State	Solid state, crystal structure and X-ray diffraction	2	**15**

Infrastructure .11	
Required textbooks ●	

1-G.E.Rodgers, Descriptive inorganic chemistry, coordination and solid state,2nd Ed, Brooks/ Cole, Thomson , (2002) **2-G.L.Miessler and D.A.Tarr , Inorganic chemistry . 2nd Ed, Prentice Hall, Upper Saddle , River, NJ, (1999)** **3-F.A.Cotton and G.Wilkinson Basic inorganic chemistry.3rdEd,Wiley New york, (1995)** **4-Whitten,Davis,Peck, Stanely, General chemistry, 7th Ed. , Brooks/ Cole, Thomson, (2003)** **5- N.N.Greenwood and A.Earnshaw , Chemistry of elements, (1999)** **6-J.E.Huheey,E.A.keiter, R.L.Keiter, Inorganic Chemistry,4th Ed. Harper ,Collins, New York, (1993)** **7-Shriver & Atkins, Inorganic chemistry, 4th Ed, Peter Atkins, Tina Overton, Oxford, University Press, (2006)** **8- C.E.Housecroft and A.G.Sharpe, Inorganic chemistry, 3rd Ed., Prentice Hall, (2008)**	Main references (sources) ●
General Inorganic Chemistry	Recommended books and references (scientific journals, reports, etc.) ●
• Electronic references, Internet sites. Electronic references were used.	• Electronic references, Internet sites. Electronic references were used.

Curriculum Development Plan .12
The increasing use of information technology, the extraction of reliable e-books, and the updating of vocabulary and curricula to ensure keeping pace with the great development in the world of technology.

Course Description / Physical Chemistry 1

This course description provides Thermodynamics is to identify the three basic laws of thermodynamics, conversions of work into heat energy, isothermal and adiabatic processes, enthalpy and internal energy, spontaneous and non-spontaneous processes, the entropy relationship and Kipps free energy, and then the thermodynamic applications of these laws / chemical equilibrium.

1. Educational institution	University of Baghdad
2. Scientific Department / Center	Faculty of Science / Department of Chemistry
3. Course Name/Code	**Physical Chemistry 1** 221 ChPC/
4. Available forms of attendance	Weekly
5. Semester/Year	First semester2023-2022

.6 Number of study hours (total)	2 hours30 = 15 x hours
.7 Date this description was prepared	**1/9/2022**
.8 Course Objectives	
The aim of teaching the subject of Physical Chemistry / Thermodynamics is to identify the three basic laws of thermodynamics, conversions of work into thermal energy, isothermal and adiabatic processes, enthalpy and internal energy, spontaneous and non-spontaneous processes, the entropy relationship and Kipps free energy, and then the thermodynamic applications of these laws / chemical equilibrium in gaseous systems and solutions, properties of dilute solutions, ideal and non-ideal solutions, phase equilibrium, etc.	

.9 Course outcomes, teaching, learning and assessment methods
A- Cognitive objectives. A1- Enable students to gain knowledge and understanding of the intellectual framework of chemistry A2- Enable students to gain knowledge and understanding of international chemical standards A3- Enable students to gain knowledge and understanding of the laws of chemistry A4- Enable students to gain knowledge and understanding of the standards of chemical analysis A5- Enable students to gain knowledge and understanding of the law of misuse of chemicals A6- Enable students to gain knowledge and understanding of chemistry systems Enable students to gain knowledge and understanding of chemistry in English
B - Course specific skill objectives B1 - Scientific and practical skills B2 - Recall and analysis skills B3 - Use and development skills
Evaluation methods
Daily tests with multiple-choice questions for academic subjects - Participation grades for difficult competitive questions for students - Setting grades for assigned homework - Qualitative and quantitative practical tests in laboratories
C- Emotional and value-based objectives C- Thinking skills and scientific problem-solving skills

A1 - Enabling students to solve problems related to the intellectual framework of chemistry
A2 - Enabling students to solve problems related to international chemistry standards
A3 - Enabling students to solve problems related to the laws of control and quality of chemistry
A4 - Enabling students to solve problems related to chemistry and in the English language

Teaching and learning methods

Providing students with the basics and additional topics related to the previous educational outcomes of skills to solve scientific problems
- Solving a set of practical examples by the academic staff
- Asking students during the lecture to solve some scientific problems

Evaluation methods

- Daily exams with multiple-choice questions that require scientific skills
- Daily exams with scientific and practical questions
- Participation grades for competition questions for academic topics
- Setting grades for homework
- Assigning students to do scientific seminars and discuss them

D - General and transferable skills (other skills related to employability and personal development).
D1 - Enable students to think and analyze topics related to the intellectual framework and international chemical standards
D2 - Enable students to think and analyze topics related to company laws and chemical audit standards
D3 - Enable students to think and analyze topics related to language systems for importing chemicals
D4 - Enable students to think and analyze topics related to chemistry in English

Course Structure .10

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	week
Exams	Using paper lectures + whiteboard	Gas laws	Introduction to physical chemistry, including units of measurement, properties of gases, individual gas laws, and the unified gas law.	**2**	**1**
Exams	Using paper lectures + whiteboard	Gas Laws	Mixture of gases, Dalton's law, definition of thermodynamics +	**2**	**2**

			zeroth law of thermodynamics, temperature and basic concepts		
Exams	Using paper lectures + whiteboard	First Law of Thermodynamics	First law of thermodynamics, general expression for free expansion work, reversible work, dealing with heat	**2**	**3**
Exams	Using paper lectures + whiteboard	First Law of Thermodynamics	enthalpy, joule experiment, heat capacity, relationship between heat capacity	**2**	**4**
Exams	Using paper lectures + whiteboard	First Law of Thermodynamics	Dependence of enthalpy on temperature, adiabatic processes and their relationships	**2**	**5**
Exams	Using paper lectures + whiteboard	First Law of Thermodynamics	Thermochemistry and its laws, enthalpy dependence on temperature	**2**	**6**
Exams	Using paper lectures + whiteboard	Thermochemistry	Heat of solution, heat of melting, heat of neutralization, heat of dilution	**2**	**7**
Exams	Using paper lectures + whiteboard	Thermochemistry	The second law of thermodynamics and enthalpy	**2**	**8**
Exams	Using paper lectures + whiteboard	Second Law of Thermodynamics	Anthropy of the second processes Temperature Anthropy of the phase transition	**2**	**9**
Exams	Using paper lectures + whiteboard	Second Law of Thermodynamics	Entropy changes with temperature	**2**	**10**
Exams	Using paper lectures + whiteboard	Second Law of Thermodynamics	Entropy in irreversible processes Entropy of mixing ideal gases	**2**	**11**
Exams	Using paper lectures + whiteboard	Second Law of Thermodynamics	Thermal engines and their efficiency, the third law of thermodynamics	**2**	**12**
Exams	Using paper lectures + whiteboard	Thermodynamic Machines	Free energy of compression + basic equations for closed systems	**2**	**13**
Exams	Using paper lectures + whiteboard	Maxwell's relations	Maxwell relations, thermodynamic calculations	**2**	**14**
امتحانات	Using paper lectures + whiteboard	Fundamental equations of open systems	For basic equations of open systems + chemical potential	**2**	**15**

Infrastructure .11	
• Required textbooks	Thermodynamics and its applications in chemistry

Professor Dr. Jalal Mohamed Salah	
Physical chemistry Alberty and silbey	• Main references (sources)
Physical chemistry Alberty and silbey	• Recommended books and references (scientific journals, reports, etc.)
Youtube, Google	• Electronic references, Internet sites

12. Curriculum development plan
The curriculum is developed using modern foreign books and sources in the fields of thermodynamics in preparation for learning the aspects of thermodynamics of solutions and statistics in addition to the traditional ones.

Course Description / Physical Chemistry (Practical) -1-

This course description provides applications in kinetics, thermodynamics, electricity, light, nanotechnology, laboratory applications of physical chemistry, and the extent to which students benefit from the practical aspect

and its application in the theoretical lesson and its application in practical life after graduation.

1. Educational institution	University of Baghdad /
2. Academic department/center	Chemistry - College of Science
3. Course name/code	Physical Chemistry (Practical) -1 222 ChPp/-
4. Available forms of attendance	Weekly
5. Semester/year	First Semester/2023-2022
6. Number of study hours (total)	hours60 = 15 x hour4s
7. Date this description was prepared	9/1/2022

1. Course objectives: Applications in kinetics, thermodynamics, electricity, light, nanotechnology, laboratory applications of physical chemistry, and the extent to which students benefit from the practical aspect and apply it in the theoretical lesson and apply it in practical life after graduation. New experiments have been introduced to keep pace with scientific development. All students participate in the electronic class and conduct daily and weekly exams and assignments (and quizzes) for experiments.

1- Determination of the relative and absolute densities of a liquid or solution.

2-Heat of solution.

3-Molecular Weight Determination

4-Density of Gases and Vapors

5-Refractometry

6-Thermochemistry

7-Equilibrium Constant

8-Properties of Dilute Solution

9-Relative Molecular Mass

10-A Three Component Liquid System

2. Course outcomes, teaching, learning and assessment methods

A- Cognitive objectives

A1- Study the practical applications of physical chemistry and the extent of their benefit in the future

A2- Identify laboratory measuring devices and benefit from them in industry

A3- Accustom students to relying on their abilities in performing practical experimentsA4- Teaching students to respect the time allocated for laboratory work. A5- Teaching students to take care of laboratory equipment and tools in order to continue work. A6- Teaching students how to deal with chemicals and general safety in the laboratory.

B - Course specific skill objectives

B1 - Practical applications of theoretical physical chemistry in the laboratory and the extent of benefit from them
B2 - Introducing modern experiments related to the curriculum for the academic year
B3 - Teaching students to derive information from modern means of communication from the Internet and benefit from them
B4 - Adherence to laboratory instructions and holding accountable those who violate them. Teaching students to participate in the electronic class and interact in it by committing to performing electronic exams and submitting reports on experiments

Teaching and learning methods

Detailed explanation of experiments on the board and providing general information related to physical experiments and how to prepare solutions with specific concentrations and weights according to the physical laws specific to this purpose. Theoretical explanation with calculations and their clarification in the electronic class with conducting the tests and submitting reports and assignments

Evaluation methods

- Daily exams and weekly assignments (electronic quizzes).

2- Weekly reports (electronic reports)

3- Evaluating students on their behavior and the extent of their respect for time, as well as their commitment to the time of the electronic quiz and the time of submitting the report electronically.

4- Participating in the electronic class and interacting in it.

C- Emotional and value-based goals

C1-- Evaluating outstanding students and encouraging them to continue to excel

C2- Involving students in solving their problems

C3- Helping them correct the mistakes they are going through as much as possible

Teaching and learning methods

By working in the laboratory, preparing standard solutions, and learning how to use special measuring devices. As well as explaining the experiments theoretically in the electronic class and a detailed explanation of the experiment and its calculations in the lecture. Video and conduct weekly assignments and homework and submit reports on experiments for the purpose of calculating students' efforts.

Evaluation methods

1- Weekly exams (electronically)
2- Weekly reports (electronically)
3- Submitting weekly assignments for the purpose of calculating effort
4- Following up on student attendance in the electronic class.

D - General and transferable skills (other skills related to employability and personal development).

Providing students with the basics and additional topics related to the outputs of thinking and chemical analysis
- Forming discussion groups during lectures to discuss chemical topics that require thinking and analysis
- Asking students a set of thinking questions during lectures such as what, how, when and why for specific topics
- Giving students homework that requires self-explanations in causal ways

Course structure .3

Evaluation method	Teaching method	Unit name / or topic	Required learning outcomes	Hours	week
Conducting daily exams, submitting weekly reports, and monitoring work and behavior inside the laboratory and electronically through belonging to the electronic class	In the laboratory in the first weeks	An introductory lecture and a simplified explanation of the experiments and the most important vocabulary and devices that the student must be familiar with in the laboratory	Use of the board + practical explanation	Inside the lab 4 hours	1,2
	Inside the laboratory	Determination of the relative and absolute densities of a liquid or solution.	Practical in the laboratory	Inside the lab 4 hours	3
	Inside the laboratory	Heat of solution.		Inside the lab 4 hours	4
		3-Molecular Weight Determination	Practical in the laboratory	Inside the lab 4 hours	5
	Inside the lab	Density of gases and vapors	Practical in the laboratory	Inside the lab 4 hours	6
		Refractometry	Practical in the laboratory	Inside the lab 4 hours	7
	Inside the lab	A))- Determination of Calorimetric constant. (B) Determination of the heat of solutions	My Lab Work	Inside the lab 4 hours	8
		7-Equilibrium Constant	Lack of Materials	Inside the lab 4 hours	9

	Inside the lab	8-Distribution of solute between immisible solvents.	My Lab Work	Inside the lab 4 hours	10
		9-Relative Molecular Mass	My Lab Work	Inside the lab 4 hours	11
	Inside the lab	10-Three component liquid system.	My Lab Work	Inside the lab 4 hours	12
Compensatory week for students due to holidays and national occasions					13
Final exam					14
Final exam					15

Infrastructure .4	
• Required textbooks	Experiments in physical chemistry by JAMIS.
• Main references (sources)	Practical physical chemistry book supervised by A.M. Hoda Najm El-Din and M. Haifa Abdul Amir
• Recommended books and references (scientific journals, reports, etc.)	Fundamentals of physical chemistry and its practical applications by Dr. Khaled Issa Al-Ani (1980). Practical physical chemistry, A.M.James and F.E.Richard 3rd.ed.
• Electronic references, Internet sites	Experiments inphysical chemistry,David P.Shoemaker,Carl W.Garland,Jeffrey I.Steinfeld.

5. Plan for developing the curriculum
teaching in the laboratory by developing scientific experiments and introducing new experiments to work in the laboratory that keep pace with new scientific developments, experiments in nanotechnology and solar energy cells. Developing the foundations of education in electronic classes and participating in them in activities, exams and daily assignments.

Course Description / Organic Chemistry -1-

This course description provides an understanding of the subject in terms of diagnosing organic materials and preparing chemical materials at this stage, and thus understanding pharmaceutical materials and chemical materials in the advanced stages of their studies.

1. Educational Institution	Ministry of Higher Education and Scientific Research
2. University Department/Center	College of Science, Department of Chemistry/University of Baghdad
3. Course Name/Code	Theoretical Organic Chemistry 1/ **223 ChOC**
4. Available Attendance Forms	Weekly
5. Semester/Year	First 2023-2022
6. Number of Study Hours (Total)	2 hours = 15 x 30 hours
7. Date this Description was Prepared	1-9-2022

1. Course objective

Building students with a foundation in organic chemistry that qualifies them to understand the material in terms of diagnosing organic materials and preparing chemical materials at this stage and thus understanding pharmaceutical materials and chemical materials in the advanced stages of their studies.

2. Learning outcomes, teaching and learning methods and assessment

A- Cognitive objectives

A1- Theoretical organic chemistry

How to study and prepare materials and discover the effective groups

B - Course specific skill objectives

B1 - Innovating comprehensible methods and linking them to the practical part of them in brief and fruitful ways

B2 - Facilitating the subject in simplified and planning ways

Teaching and learning methods

Theoretical methods by giving theoretical lectures in classrooms and publishing them on websites and conducting activities on the Telegram site dedicated to them with the title (Membership 2020)
and video lectures and conducting a live meeting with students after each video

Evaluation methods

By conducting short paper exams, semester exams and activities through the same Telegram channel.

C- Emotional and valuable goals

C1- The student has immediate questions in the lecture to ensure his understanding of the material

C2- Training the student on known models

C3- Finding stimulating questions that help in understanding and comprehension

C4- Allowing the student to participate in the solution by giving and conducting a simple poll to know the number of those who have comprehended

Evaluation methods

Grades are given for attendance, written and electronic exams. Short exams and homework assignments were given, as well as monthly exams scheduled in advance, and reports on organic chemistry were written for the topics that were given electronically and analytically.

D- General and transferable skills (other skills related to employability and personal development)

D1- Use modern sources

D2- Use the Internet and include questions through the mentioned channels

Course structure .3

Evaluation Method	Teaching Method	Name of Unit/Course or Topic	Required Learning Outcomes	hours	Week
Written and Classroom Activity	Using in-person and video paper lectures	General	Structure and Properties	2	1st
Written and Classroom Activity	Using in-person and video paper lectures	Alkanes	Methane	2	2nd
Written and Classroom Activity	Using in-person and video paper lectures	Alkanes	Alkanes: Properties and Stereoisomers	2	3rd
Written and Classroom Activity	Using in-person and video paper lectures	Alkanes	Alkanes: Preparation	2	4th
Written and Classroom Activity	Using in-person and video paper lectures	Alkanes	Alkanes: Reactions	2	5th
Written and Classroom Activity	Using in-person and video paper lectures	Alkanes	Alkenes: Properties and Nomenclature	2	6th
Editorial and Class Activity	Using paper lectures, in-person and video	Alkenes	Alkenes: Preparation	2	Seventh
Editorial and Class Activity	Using paper lectures, in-person and video	Alkenes	Alkenes: Reactions	2	Eighth
Editorial and Class Activity	Using paper lectures, in-person and video	Alkenes	Alkenes: Reactions	2	Ninth

Editorial and Class Activity	Using paper lectures, in-person and video	Alkynes	And Identification	2	Tenth
Editorial and Class Activity	Using paper lectures, in-person and video	Alkynes	Alkynes: Properties	2	Eleventh
Editorial and Class Activity	Using paper lectures, in-person and video	Dienes	And Nomenclature and Preparation	2	Twelfth
Editorial and Class Activity	Using paper lectures, in-person and video	Cycloalkanes	Alkynes: Reactions	2	Thirteenth
Editorial and Class Activity	Using paper lectures, in-person and video	Cycloalkanes	And Identification	2	Quarteteenth
Editorial and Class Activity	Using paper lectures, in-person and video	General	Dienes: Properties	2	Fifteenth

11. Infrastructure

	Required readings: Basic texts Course books Other ▪
Numerous and varied and included in the performance evaluation form	Special requirements (including, for example, workshops, periodicals, software, and websites)
Attending many cultural and scientific lectures conducted by the department	Social services (including, for example, guest lectures, vocational training, and field studies)
Morrison and Boydb	• Required textbooks

ook, 6th edition	
Mucc nurry book	• Main references (sources)
-Princ iples of	• Recommended books and references (scientific journals, reports, etc.)

organicchemistry, Salnon - Organicletters,	

UKreports	
https://ar.wikipedia.org/wiki/%D9%83%D	• Electronic references, Internet sites

D9%8A%D9%85%D9%8A%D8%A7%D8	

12. **Curriculum development plan**
- Adding illustrative means, especially when explaining the stereochemistry of organic compounds that contain asymmetric carbon atoms **- Using electronic simulations of some typical videos published on sites such as YouTube and others, and benefiting from the global experiences that preceded the use of e-learning and blended learning.**

Course Description Form

For the Second Stage

Second Semester

2023-2022

Course Description / Analytical Chemistry -4-

This course description provides students with an introduction to chemical separation methods and a study of their importance in chemical analysis.

And a study of the optimal conditions for choosing a specific separation method and the conditions that must be met for any separation method. And a study of the types of chemical separation methods and a study of the basic principles of each type and a study of the mathematical treatment of each method.

University of Baghdad	**1. Educational institution**
Department of Chemistry	**2. Academic department/center**
Analytical Chemistry (4) 226 ChAC/	**3. Course name/code**
Weekly	**4. Available forms of attendance**
Second/ 2023-2022	**5. Semester/year**
hours30 = 15 x hours2	**6. Number of study hours (total)**
1-9-2022	**7. Date this description was prepared**

Course objectives .1

1– Students are introduced to chemical separation methods and their importance in chemical analysis is studied.

2- Study the optimal conditions for choosing a specific separation method and the conditions that must be met for any separation method.

3- Study the types of chemical separation methods and study the basic principles of each type and study the mathematical treatment of each method. **4- Address the analytical importance of each separation method and study its applications.**

Course outcomes, teaching, learning and assessment methods .2
A- Cognitive objectives **A1- The student should be aware of the importance of studying chemical separation methods** **A2- The student should be familiar with the most important analytical applications of separation methods**
B - Course specific skill objectives **B1 - To analyze any important material, one must be familiar with the appropriate separation methods for analyzing this material** **B2 - Identify the importance of analytical concepts for different separation methods**
Teaching and learning methods
Using known learning methods through explaining the theoretical material -1 **Using the Classroom platform and videos as a means to show important information during the explanation** -2
Evaluation methods
1- Monthly written tests **2- Asking inferential questions during the lecture and preparing homework** **3- Conducting a quick daily exam during the lecture time**
C- Emotional and value-based objectives **C1- Written tests** **C2- Homework**
Teaching and learning methods
Finding stimulating questions for the student to facilitate his understanding of the theoretical material and using the Classroom platform as part of presenting the topic under lecture

Evaluation methods

1- Student activity during the lecture by answering oral and written questions and discussing the importance of separation methods in analytical chemistry.
2- Student attendance and commitment to lecture time.
3- Daily and semester exams.

D- General and transferable skills (other skills related to employability and personal development). D1- Encouraging them to borrow scientific books from the university library to benefit from them scientifically. D2- Selected groups of students are assigned to follow up on scientific research and articles in international journals. D3- Discussing scientific research where it is presented by students using the display screen

Course structure .3

Evaluation Method	Teaching Method	Unit Name / Topic	Required learning outcomes	hours	week
Semester and Weekly Exams	In-person	Chapter Methods	***Separation Methods*** - Introduction to chromatography - What is meant by Chromatography ***Classification of Chromatographic Methods*** Adsorption Chromatography - Partition Chromatography - Ion-exchange Chromatography - Molecular Exclusion Chromatography -	**2**	**1**
Semester and Weekly Exams	Classroom Platform	Chapter Methods	***The Chromatographic Process*** Physical principles of chromatographic separation - Retention parameters	**2**	**2**
Midterm and Weekly Exams	My presence	Methods of separation	Retention factor, selectivity, and resolution - How to calculate H and N from a chromatogram	**2**	**3**
Midterm and Weekly Exams	Classroom platform	Methods of separation	***Theoretical concepts of the chromatography*** The plate theory The dynamic theory (van Deemter equation)	**2**	**4**
Midterm and Weekly Exams	My presence	Methods of separation	**Continued** The dynamic theory (van Deemter equation)	**2**	**5**
Midterm and Weekly Exams	Classroom platform	Methods of separation	**Solved Problems** Five examples - ***Column Chromatography*** Principles - Separation - Normal phase and R-phase -	**2**	**6**

			What Do You Understand By Isocratic And Gradient Elution? -		
Midterm and Weekly Exams	My presence	Methods of separation	***Paper and Thin-layer Chromatography*** **Paper Chromatography** .1 Principles - Qualitative PC - Solvent systems for PC applications - What Are The Limitations Of Paper Chromatography Technique -	**2**	**7**
Midterm and Weekly Exams	Classroom platform	Methods of separation	**Thin-Layer Chromatography (TLC)** .2 Principles - Qualitative TLC - Efficiency and Resolution in Thin Layer Chromatography - Factors that influence separation and rate of elution Advantages of TLC	**2**	**8**
Midterm and Weekly Exams	My presence	Methods of separation	**The First Exam**	**2**	**9**
Midterm and Weekly Exams	Classroom platform	Methods of separation	**Liquid-Liquid Extraction** Distribution Coefficient: - Distribution Ratio (D) - Relationship between D and K_D from the involved equilibrium processes - Percentage Extraction (%E) - The factors affecting the separation efficiency: - Selectivity of Extraction - Applications of Solvent Extraction	**2**	**10**
Midterm and Weekly Exams	My presence	Methods of separation	**Ion-Exchange Chromatography** What is the Ion Exchange - What are Ion-Exchangers - General Properties of Exchange Media - What main types of Ion Exchangers are? - *Cation Exchange Resins :* -1	**2**	**11**
Midterm and Weekly Exams	Classroom platform	Methods of separation	*Anion Exchange Resins*: -2 Classification of Organic Ion Exchange Resins - How ion exchange resins work - Selectivity - Capacity of Ion exchanger - Applications of Ion Exchange Resins:	**2**	**12**
Midterm and Weekly Exams	My presence	Methods of separation	Discussion of research submitted by students	**2**	**13**

Midterm and Weekly Exams	Classroom platform	Methods of separation	Discussion of research submitted by students	2	14
Midterm and Weekly Exams	My presence	Methods of separation	**The Second Exam**	2	15

Infrastructure .4	
Introduction to Analytical Chemistry 7th Edition (1999), Skoog and West	• Required textbooks
Fundamentals of Analytical Chemistry 8th Edition (2004), Skoog and West, Holler and Krok Analytical Chemistry 6th Edition (2004),	• Main references (sources)
Any book or scientific journal that deals with the subject of separation methods in analytical chemistry	• Recommended books and references (scientific journals, reports, etc.)
Websites that concern analytical chemistry	• Electronic references, Internet sites

Curriculum Development Plan .5
The increasing use of information technology or reliable Internet references as a result of keeping pace with the great development in the world of analytical techniques and the use of modern separation methods.

Course Description / Inorganic Chemistry (Practical) -1-

This course description provides the student with many basic concepts and facts about the methods of preparing and purifying some salts. The student learns the methods of preparing some salts such as alum and its benefits. The student learns some separation techniques, namely paper chromatography, for the purpose of separating halides.

University of Baghdad / College of Science	1. Educational institution

2. Academic department/center	Chemistry Department
3. Course name/code	Inorganic Chemistry Laboratory 227 ChPI/-1-
4. Available forms of attendance	Weekly
5. Semester/year	Second /2023-2022
6. Number of study hours (total)	hours60 = 15 x hours4
7. Date this description was prepared	1-9-2022

1. Course objectives

The student learns many basic concepts and facts about the methods of preparing and purifying some salts

The student learns the methods of preparing some salts such as alum and its benefits

The student learns some separation techniques, namely paper chromatography for the purpose of separating halides

The student learns to find some extracted calculations necessary to extract concentrations, weights or percentages of the prepared substance

The student acquires some skills by conducting experiments such as weighing, calibration, drying and purification

2. Course outcomes, teaching, learning and assessment methods

A- Cognitive objectives

A1- Identify the benefits and harms of chemicals through direct contact

A2- Take the necessary precautions against the harms of these materials

A3- Educate students to wear gloves, masks and protective glasses while in the laboratory

B - Course specific skill objectives

B1 - Teaching students different techniques such as calibration, weighing, drying and purification

B2 - Preparing chemical materials such as alum and others

Teaching and learning methods

- Daily surprise tests and continuous weekly tests.
- Training and activities in the classroom.
- Guiding students to some websites to benefit from them.

Evaluation Methods

D- General and transferable qualification skills (other skills related to employability and personal development).

D1- Assigning students to review what is published on the subject of the semester through the Internet

D2- Urging students to borrow scientific sources from the department or college library to review the subject of study

Oral, monthly and daily exams for students

3. Course structure

Evaluation method	Teaching method	Unit/Course or Topic Name	Required learning outcomes	hours	week
		Grouping Students with Laboratory Instructions		4	1

Quiz + direct questions for students	Blackboard	Paper Chromatography		4	2
Quiz + direct questions for students	Blackboard	Determination of Hydrogen Peroxide Concentration		4	3
Quiz + direct questions for students	Blackboard	Purification of Table Salt		4	4
Quiz + direct questions for students	Blackboard	Alum 1		4	5
Quiz + direct questions for students	Blackboard	Alum 2		4	6
Quiz + direct questions for students	Blackboard	Preparation of Potassium Periodate		4	7
Quiz + direct questions for students	Blackboard	Preparation of Copper Iodate and Calculation of Its Solubility Product Constant		4	8
Quiz + direct questions for students	Teaching method	Investigation of the Reaction between Copper Sulphate and Sodium Hydroxide		4	9
Quiz + direct questions for students	Blackboard	Oxygen and Sulfur		4	10
		Review and Comprehensive Exam		4	11
		Final Practical Exam		4	12

Infrastructure .4	
A notebook in practical inorganic chemistry	• Required textbooks
Basics of practical inorganic chemistry	• Main references (sources)
Scientific journals, periodicals and research in the specialty	• Recommended books and references (scientific journals, reports, etc.)
Internet sites, Google, YouTube and social media in the specialty.	• Electronic references, Internet sites

Curriculum Development Plan .5
- Developing the educational content by deleting, adding and replacing. **- Using modern teaching methods according to the nature of the subject and the level of the learners from time to time.** **- Using modern assessment tools that the student interacts with and at the same time keeps him away from the atmosphere of boredom and repetition**

Course Description / Inorganic Chemistry -4-

This course description provides the aim of studying groups 15-18 nitrogen, oxygen, halogens and noble metals (studying their properties, reactions, important compounds and their shapes and calculating their formal charge). Acids and bases (definition of Arrhenius, Bronsted-Lowry, Lewis, acidic strength, oxyacids, classification of Bronsted acids and bases, hard and soft Lewis acids and bases. Solvents, classification of solvents, effect of solvents on solute behavior).

University of Baghdad - College of Science	1. Educational institution
Chemistry Department	2. Academic department/center
Inorganic Chemistry -4) Theoretical / 228 ChIC	3. Course name/code
Weekly	4. Available forms of attendance
Second Semester / 2023-2022	5. Semester/year
hours30 = 15 x hours 2	6. Number of study hours (total)
1-9-2022	7. Date this description was prepared

1. Course objectives

Inorganic Chemistry (4) Theoretical: The course aims to study groups } 18-15 nitrogen group, oxygen, halogens and noble elements (study their properties, reactions, important compounds and their shapes and calculate their formal charge). Acids and bases (definition of Arrhenius, Bronsted-Lowry, Lewis, strength of acidic property, oxyacids, classification of Bronsted acids and bases, hard and soft Lewis acids and bases. Solvents, classification of solvents, effect of solvents on solute behavior).

2. Course outcomes, teaching, learning and assessment method

A- Cognitive objectives

A1- Identify the properties of elements and their role in determining the chemical properties of compounds

A2- Identify the various tests for diagnosing chemical compounds

A3- Know the theoretical foundations of scientific techniques

B - Course specific skill objectives

B1 - Identify some of the methods and experiments used to diagnose chemical compounds

B2 - Identify the techniques in diagnosing chemical compounds descriptively and quantitatively

Teaching and learning methods

1- E-learning using Google Classroom

2- Preparing reports and homework

Evaluation methods
-Electronic tests 2-Putting inferential questions within the lecture 3-Preparing reports and homework 4-Commitment to attendance
C- Emotional and value-based objectives C1- Student training C2- Student evaluation
Teaching and learning methods
- Record lectures on video and share them with students through online classes.
Evaluation methods
• Student contribution to discussions ● • Evaluation of attendance ● • Discussion of reports ●
D- General and transferable skills (other skills related to employability and personal development). D1- Encouraging students to rely on some sources in preparing reports D2- Clarifying the general principles in classifying materials and identifying their cognitive importance

Course structure .3

Evaluation Method	Teaching Method	Unit Name / or Topic	Required learning outcomes	hours	week
Written Exams and Homework	Using the display with the use of writing on the white board	Group 15	Nitrogen group elements (chemical properties, preparation of nitrogen compounds, hydrazine nitrides,	2	**1**
Written Exams and Homework	Using the display with the use of writing on the white board	Group 15	hydrozoic acid and others. Calculate the formal charge of nitrogen compounds	2	**2**
Written Exams and Homework	Using the display with the use of writing on the white board	Group 15	Nitrogen adacasides	2	**3**
Written Exams and Homework	Using the display with the use of writing on the white board	(Nitrogen and its Compounds)	N2O, NO), N2O3, NO2, N2O5,, oxyacids,, N4S4 compounds	2	**4**
الامتحانات التحريرية	Using the display with the use of	Group 15	Nitrogen group elements compounds	2	**5**

والواجب البيتي	writing on the white board				
Written Exams and Homework	Using the display with the use of writing on the white board	Group 16 and its properties	Coordination numbers, formation of covalent bonds and chains, oxygen compounds	2	**6**
Written Exams and Homework	Using the display with the use of writing on the white board	Group 16 (Oxygen and its compounds)	oxides, hydroxides, properties of oxygen group elements,	2	**7**
Written Exams and Homework	Using the display with the use of writing on the white board	Group 16 (Oxygen and its compounds)	oxygenic acids, peroxides, thiosulfuric	2	**8**
Written Exams and Homework	Using the display with the use of writing on the white board	Group 17	halogen group, properties, hydrogen halides,	2	**9**
Written Exams and Homework	Using the display with the use of writing on the white board	and its properties and compounds	halogen oxides salts, oxygenic acids	2	**10**
Written Exams and Homework	Using the display with the use of writing on the white board	Group 17	inter-halogens, anions and cations of polyhalides	2	**11**
Written Exams and Homework	Using the display with the use of writing on the white board	and its properties and compounds	halogens and their analogues	2	**12**
Written Exams and Homework	Using the display with the use of writing on the white board	Group 17	noble group of elements, compounds, properties and reactions	2	**13**
Written Exams and Homework	Using the display with the use of writing on the white board	Acids and Bases	Lewis acids, Pearson classification, soft and hard acids and bases	2	**14**
Written Exams and Homework	Using the display with the use of writing on the white board	Solvents	Solvents, classification, aqueous and non-aqueous solvents, protic and non-protic solvents, acidic and basic solvents	2	15

Infrastructure

	• Required textbooks
1-G.E.Rodgers, Descriptive inorganic chemistry, coordination and solid state,2nd Ed, Brooks/ Cole, Thomson , (2002) **2-G.L.Miessler and D.A.Tarr , Inorganic chemistry . 2nd Ed, Prentice Hall, Upper Saddle , River, NJ, (1999)** **3-F.A.Cotton and G.Wilkinson Basic inorganic chemistry.3rdEd,Wiley New york, (1995)** **4-Whitten,Davis,Peck, Stanely, General chemistry, 7th Ed. , Brooks/ Cole, Thomson, (2003)** **5- N.N.Greenwood and A.Earnshaw , Chemistry of elements, (1999)** **6-J.E.Huheey,E.A.keiter, R.L.Keiter, Inorganic Chemistry,4th Ed. Harper ,Collins, New York, (1993)** **7-Shriver & Atkins, Inorganic chemistry, 4th Ed, Peter Atkins, Tina Overton, Oxford, University Press, (2006)** **8- C.E.Housecroft and A.G.Sharpe, Inorganic chemistry, 3rd Ed., Prentice Hall, (2008)**	• Main references (sources)
General Inorganic Chemistry	• Recommended books and references (scientific journals, reports, etc.)
Electronic references were used.	• Electronic references, websites

Curriculum development plan4.
Increasing use of information technology, extraction of reliable e-books, and updating vocabulary and curricula to ensure keeping pace with the great development in the world of technology

Course Description / Physical Chemistry 2

This course description provides: Principles of thermodynamics for chemical reactions at equilibrium states in homogeneous and heterogeneous system. Plus, principles of thermodynamics for different phases at equilibrium state

University of Baghdad	1. Educational institution
Department of Chemistry / College of Science	2. Academic department/center
Physical Chemistry 2) / 229 ChPC	3. Course name/code
Weekly	4. Available forms of attendance
Second Course / 2023-2022	5. Semester/year
hours30 = 15 x hours2	6. Number of study hours (total)
1-9-2022	7. Date this description was prepared

1. Course objectives .1

Principles of thermodynamics for chemical reactions at equilibrium states in homogeneous and heterogeneous system. Plus, principles of thermodynamics for different phases at equilibrium state

Course outcomes, teaching, learning and assessment methods .2

A- Cognitive objectives.

A1- Enable students to obtain knowledge and understanding of the intellectual framework of chemistry

A2- Enable students to obtain knowledge and understanding of international chemical standards

A3- Enable students to obtain knowledge and understanding of the laws of chemistry

A4- Enable students to obtain knowledge and understanding of the standards of chemical analysis

A5- Enable students to obtain knowledge and understanding of the law of misuse of chemicals

A6- Enable students to obtain knowledge and understanding of chemistry systems

B - Course specific skill objectives

B1 - Scientific and practical skills

B2 - Recall and analysis skills

B3 - Use and development skills

Teaching and learning methods

Providing students with the basics and topics related to knowledge and systems explained in:

1 - Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using LCD screens and Data show

2 - Providing students with knowledge through homework assignments for the study vocabulary

3 - Asking students to visit the library to obtain academic knowledge related to the study vocabulary

4 - Improving students' skills by visiting websites to obtain additional knowledge of the study materials

Evaluation Methods

DaiDaily tests with multiple-choice questions for academic subjects

- Participation grades for difficult competitive questions for students
- Assigning grades for assigned homework
- Qualitative and quantitative practical tests in laboratories

C- Emotional and value-based objectives

C- Thinking skills and scientific problem-solving skills

A1 - Enabling students to solve problems related to the intellectual framework of chemistry

A2 - Enabling students to solve problems related to international chemistry standards

A3 - Enabling students to solve problems related to the laws of control and quality of chemistry

A4 - Enabling students to solve problems related to chemistry and in the English language

Teaching and learning methods

Providing students with the basics and additional topics related to the previous educational outcomes of skills to solve scientific problems

- Solving a set of practical examples by the academic staff

- Asking students during the lecture to solve some scientific problems

Evaluation Methods

- Daily exams with multiple-choice questions that require scientific skills
- Daily exams with scientific and practical questions
- Participation grades for competition questions for academic topics

- Setting grades for homework
- Assigning students to do scientific seminars and discuss them

D - General and transferable skills (other skills related to employability and personal development).

D1 - Enable students to think and analyze topics related to the intellectual framework and international chemical standards

D2 - Enable students to think and analyze topics related to company laws and chemical audit standards

D3 - Enable students to think and analyze topics related to language systems for importing chemicals

D4 - Enable students to think and analyze topics related to chemistry in English

3. Course structure

week	hours	Required learning outcomes	Unit name/topic	Teaching method	Evaluation method
04.05.2020 for group A **05.05.2020 for group B**	2 hours for group A 2 hours for group B	**Chemical Equilibrium**	**Chemical Equilibrium:** ● How to calculate equilibrium constants for homogenous reactions. ● Relation between K_c, K_p and K_x ● Characteristics of equilibrium constants. The Le Chatelier principle.	1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	
11.05.2020 for group A **12.05.2020 for group B**	2 hours for group A 2 hours for group B	**Chemical Equilibrium**	● The relation between Gibbs free energy and equilibrium constant. ● Determination of equilibrium constant for gas reactions. This includes two types: 1. Reactions which involves no change the number of moles. 2. Reactions which involve a change in the number of moles (increase in Δn and decrease in Δn). ● Dissociation of gases from density measurements. Chemical equilibrium for heterogeneous reactions.	1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	
19.05.2020 for group A **19.05.2020 for group B**	2 hours for group A 2 hours for group B	**Chemical Equilibrium**	● Determination of equilibrium constants in homogeneous liquid system. ● Chemical equilibrium for heterogeneous reactions. ● Calculation of chemical equilibrium by indirect method. Effect of temperature on chemical equilibrium constants.	1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	
02.06.2020 for group A	2 hours for group A	**Phase Equilibrium**	**Phase Equilibrium:** ● One component system. ● Phase diagram for water. ● Clapeyron equation. Clausius – Clapeyron equation.	1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	

			2 hours for group B	**02.06.2020 for group B**
1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	• Two components system. • Liquid-solid with (formation of eutectic mixture). • Liquid-solid with (formation of compound with congruent melting point). • Solutions/ ideal solutions.	**Phase Equilibrium**	2 hours for group A 2 hours for group B	**09.06.2020 for group A** **09.06.2020 for group B**
1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	• Solutions of gases in liquid (Henry`s law). • Liquid-liquid mixture (completely miscible) Raoult`s law for ideal solution. • Deviation from Raoult`s law: 1.Positive deviation. 2.Negative deviation • Vapor pressure / composition diagram for: a) ideal solution. b) non-ideal solution with: 1.positive deviation 2.negative deviation.	**Phase Equilibrium**	2 hours for group A 2 hours for group B	**16.06.2020 for group A** **16.06.2020 for group B**
1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	• Temperature composition diagram and boiling point composition diagram for: a) ideal solution and b) non ideal solution with: 1.positive deviation and 2.negative deviation. • Partially miscible liquids/ 1.system with upper critical solution temperature 2.system with lower critical solution temperature 3.system with upper and lower critical solution temperatures. • Immiscible liquid. Three components system.	**Phase Equilibrium**	2 hours for group A 2 hours for group B	**23.06.2020 for group A** **23.06.2020 for group B**
1.YouTube/ NA Lectures/ Physical Chemistry 2 – lecture 1 2. pdf of lecture 1.	• **Dilute solutions** • Collective properties: 1.Lowering the vapor pressure 2.Elevation of boiling point 3.Depression of freezing point 4.Osmosis and osmotic pressures. • Partial molar Gibbs free energy for two components solutions 1. ΔG_{mix} for liquid mixture (ideal solution) 2. ΔG_{mix} for two liquids vapor(ideal gas) Thermodynamic for ideal solution ΔH_{mix}, ΔS_{mix} and ΔG_{mix}.	**Diluted solutions**	2 hours for group A 2 hours for group B	**30.06.2020 for group A** **30.06.2020 for group B**
It was deleted in accordance with the Ministry's decision to delete 65% of the prescribed curriculum and was used for review	• **Statistical thermodynamics** • Boltzman relation • Partition function Q. • Translation partition function. • Rotational partition functions for diatomic molecule.	**Statistical thermodynamics**	2 hours for group A 2 hours for group B	**07.07.2020 for group A** **07.07.2020 for group B**
It was deleted in accordance with the Ministry's decision to delete 65% of the prescribed curriculum and was used for review and preparation for the semester exam and	• Vibrational partition function • Degree of freedom. • Relation between partition function and thermodynamic quantities. Relation between equilibrium constant K_{eq} and partition function Q.	**Statistical thermodynamics**	2 hours for group A 2 hours for group B	**14.07.2020 for group A** **14.07.2020 for group B**

writing the report for the purpose of evaluating the effort			
	Taking the semester exam for the purpose of evaluating the endeavor	2 hours for group A 2 hours for group B	**21.07.2020 for group A** **21.07.2020 for group B**
	Submitting reports for the purpose of evaluating the endeavor	2 hours for group A 2 hours for group B	**26.07.2020 for group A** **26.07.2020 for group B**

	. Infrastructure
• "Physical Chemistry" (printed book) by Robert A. Alberty and Robert J. Silbey. • "Physical Chemistry" (printed book) by Atkins and Paula • "Thermodynamics and its applications in Chemistry" (printed book) by J.M.Saleh.	• Required textbooks
	• Main references (sources)
	• Recommended books and references (scientific journals, reports, etc.)
	• Electronic references, Internet sites
	12. Curriculum development plan

Course Description / Organic Chemistry 2

This course description provides the aromatic compounds and their important reactions and the mechanism of these reactions, as well as an explanation of the best alcohols, alkyl halides, ethers and epoxides. It opens new horizons by presenting some concepts in new ways and innovative methods.

1. Educational institution	[University of Baghdad - College of Science - Department of Chemistry
2. Academic department/center	Department of Chemistry
3. Course name/code	Organic Chemistry 2-/ 230 ChOC
4. Available forms of attendance	Weekly
5. Semester/year	Second / 2023-2022
6. Number of study hours (total)	2 hours = 15 x 30 hours
7. Date this description was prepared	1-9-2022

1. Course objectives: Teaching students the basics and concepts of organic chemistry, completing the basics explained in the first course, where topics related to aromatic compounds, their important reactions, and the mechanics of these reactions were explained, as well as explaining the best alcohols, alkyl halides, ethers, and epoxides. Opening new horizons by presenting some concepts in new ways and innovative ways by making students interact with them to increase their knowledge of textbooks and assistance. With the presence of video lectures, the student experiences a traditional lecture environment with the same discussion methods by asking questions and the professor answering, ensuring the integration of the foundations of a successful lecture.

1. Course outcomes, teaching, learning and assessment methods

A- Cognitive objectives

A1- To achieve a good understanding of the study content of organic chemistry

A2- Preparing the student to comprehend and prepare for the topics in the subsequent stages

A3- Teaching and training the student to solve the exercises by following a special mechanism

A4- Instilling confidence in the students and encouraging them to engage in dialogue and useful discussion.

A5- Providing students with the opportunity to suggest new methods and ideas that help them understand difficult topics A6- Helping students by conducting short exams outside the time allocated for the lecture
B - Course specific skill objectives B1 - The ability to find solutions and derive ideas for various issues and mechanics B2 - Encouraging students to read and follow up by conducting electronic and video meetings B3 - Helping students use important electronic programs that facilitate their understanding of the material B4 - Also helping them in terms of teaching them some electronic programs that facilitate the process of conducting electronic exams
Teaching and learning methods
Modern methods were used in education, including video and audio lectures SCREEN RECORDER, attaching audio and video files to the Google Classroom program, and using electronic programs to meet with students directly, such as Google Meet, ZOOM, FCC, WEBAX, and others, to facilitate the task of teaching students and their understanding of the material.
Evaluation methods
Short exams were conducted and homework assignments were given, as well as monthly exams scheduled in advance, and reports were written on organic chemistry and the topics that were given.
C- Emotional and value-based objectives C1- The student understands the university behavior that must be demonstrated C2- Cultivating a spirit of cooperation among students, such that the learner provides assistance to his friends in the classroom or does group work in the classroom C3- Developing some interests and hobbies among students C4- Sensing the harms of smoking and drugs on health and society
Teaching and learning methods
Modern methods were used in education, including video and audio lectures SCREEN RECORDER, attaching audio and video files to the Google Classroom program, and using electronic programs to meet students directly, such as

Google Meet, ZOOM, FCC, WEBAX, and others, to facilitate the task of teaching students and their understanding of the material..

Evaluation methods

Short exams were conducted, homework assignments were given, and monthly specific exams were conducted. Appointment in advance as well as writing reports on organic chemistry and the topics given

D - General and transferable qualification skills (other skills related to employability and personal development).

D1-- Working on developing a distinguished personality for the student by developing cultural and social awareness, which qualifies him after graduation to serve the community

D2-- Working on creating a suitable scientific environment to prepare highly specialized cadres while developing their scientific and practical capabilities

D3- Communicating with graduate students to know the lessons they have benefited from in their field of work to work on developing the vocabulary of these lessons

D4- Using the sources and terms specific to the course

Course structure .2

Evaluation Method	Teaching Method	Unit Name / Topic	Required learning outcomes	hours	week
Quizzes, monthly exams and oral discussions	Electronic – Video Lectures	Organic Chemistry 2	Aromatic compounds	2	3-1
Quizzes, monthly exams and oral discussions	Electronic – Video Lectures	Organic Chemistry 2	Reactions of aromatic compounds	2	5-4
Quizzes, monthly exams and oral discussions	Electronic – Video Lectures	Organic Chemistry 2	Alkyl halides	2	8-6
Quizzes, monthly exams and oral discussions	Electronic – Video Lectures	Organic Chemistry 2	alcohols	2	12-9
Quizzes, monthly exams and oral discussions	Electronic – Video Lectures	Organic Chemistry 2	Ethers and epoxides	2	5-131

Infrastructure .3

Morrison and Boyd book, 6th edition	• Required textbooks
Muccmurry book	• Main references (sources)
-Principles of organic chemistry, Salmon -Organic letters, reports UK	• Recommended books and references (scientific journals, reports, etc.)
https://ar.wikipedia.org/wiki/%D9%83%D9%8A%D9%85%D9%8A%D8%A7%D8	• Electronic references, Internet sites

1. Curriculum development plan

- Adding illustrative tools, especially when explaining the stereochemistry of organic compounds that contain asymmetric carbon atoms
- Using electronic simulations of some typical videos published on sites such as YouTube and others, and benefiting from the global experiences that preceded the use of e-learning and blended learning

Course Description / Organic Chemistry (Practical) -1-

This course description provides an understanding of the diagnosis of organic materials and the preparation of chemical materials at this stage and thus an understanding of industrial materials and petrochemical materials at the advanced stages of their study.

1. Educational institution	Ministry of Higher Education and Scientific Research
2. University department/center	College of Science, Department of Chemistry / University of Baghdad
3. Course name/code	Practical Organic Chemistry (1) 231 ChPO/
4. Programs in which it is included	Organic Chemistry Laboratory
5. Available forms of attendance	Weekly
6. Semester/year	Second 2023-2022 /
7. Number of study hours (total)	hours60 = 15 x hours 4
8. Date this description was prepared	1-9-2022

Course objectives .1

Building students with a foundation in organic chemistry that qualifies them to understand the material in terms of diagnosing organic materials and preparing chemical materials at this stage and thus understanding industrial materials and petrochemical materials in the advanced stages of their studies.

Building students with a foundation in organic chemistry that qualifies them to understand the material in terms of diagnosing organic materials and preparing chemical materials at this stage and thus understanding industrial materials and petrochemical materials in the advanced stages of their studies.

2. Learning outcomes and teaching and learning methods

A- Knowledge and understanding

A1- Practical organic chemistry part one

B- Subject-specific skills

B1- Innovations of short and fruitful work methods

B2- Facilitating the subject with simplified and planning methods

B3- Understanding petrochemical materials in the future

B4- Understanding industrial materials

Teaching and learning methods:

Practical methods for conducting chemical experiments using chemicals and laboratory equipment. Continuous discussions, analyzing results, asking

questions, encouraging innovation, extracting modern methods from the Internet, and identifying and avoiding errors.
Evaluation methods using reports submitted by students for the experiments carried out and short exams as well as daily assessment of the student's technique and diagnosis to find the solutions given as unknowns.
C- Thinking skills C1- Finding a practical technique to understand the student in a practical way C2- Training the student on known models C3- Finding stimulating questions that help in understanding and comprehension C4- Giving the student unknowns to ensure the extent of his comprehension
Teaching and learning methods: using practical methods, chemicals and laboratory equipment.
Evaluation methods: written and practical
D- General and transferable skills (other skills related to employability and personal development). D1- Using modern sources D2- Using alternative methods that replace scarce materials D3- Using important notes from experts and supervising professors

Course Structure - E-Learning .2

Evaluation method	Teaching method	Unit/Course or Topic Name	Required learning outcomes	hours	week
	Practical using devices	Measuring Melting and Boiling Points	Determination of m.p.	4	1/3/2023
	Practical using devices	Measuring Boiling Points	Determination of b.p.	4	8/3/2023
	Practical using devices	Recrystallization	Recrystallisation	4	15/3/2023
	Practical using devices	Distillation	Distillation	4	22/3/2023
	Practical using devices	Preparation of Methane Gas	Preparation of methane gas	4	29/3/2023
	Using chemicals	Sodium Melting	Sodium fusion	4	5/4/2023
	Using chemicals and scientific equipment	Preparation of Methane Gas	Alkane	4	12/4/2023
	Using chemicals and scientific equipment	Preparation and detection of cyclohexane	Alkene	4	19/4/2023

	Using chemicals and scientific equipment	Preparation and detection of butyl bromide	Alkyl hailde	4	26/4/2023
	Using chemicals and scientific equipment	Preparation and detection of acetaldehyde	Carbonyl compounds	4	3/5/2023
	Using chemicals and scientific equipment	Functional groups	Function group	4	10/5/2023

Infrastructure .3	
Practical Organic Chemistry Including Qualitative Organic Analysis By Arthur I. Vogel, D.Sc.(Lond.),D.I-C.,F.R.I.C.	Required readings: Basic texts Course books Other ▪
Attending many workshops, seminars, courses and discussion groups	Special requirements (including, for example, workshops, periodicals, software, and websites)
	Social services (including, for example, guest lectures, vocational training, and field studies)

وزارة التعليم العالي والبحث العلمي

جـــهاز الإشـــراف والتقـويم العلـمي

دائرة ضمان الجودة والاعتماد الأكاديمي

استمارة وصف البرنامج الأكاديمي للكليات والمعاهد

للعام الدراسي 2022-2023

الجامعة : بغداد

الكلية /المعهد : العلوم

القسم العلمي : الكيمياء

تاريخ ملىء الملف : 2022/10/1

التوقيع :

اسم رئيس القسم : أ.م.د. ندى مطير عباس

التاريخ :1/10/2022

التوقيع :

اسم المعاون العلمي : أ.د. خالد جابر كاظم

التاريخ :1/10/2022

دقق الملف من قبل

شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي: أ.د. اسراء علي زيدان

التاريخ / /

التوقيع

مصادقة السيد العميد

أ.د. عبد الكريم عبد الله

Course structure

This academic program description provides a concise summary of the program's key features and the learning outcomes the student is expected to achieve, demonstrating whether he or she has made the most of the opportunities available. It is accompanied by a description of each course within the program.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Department of Chemistry	3. Name of academic or ofessional program
Bachelor of Science in Chemistry	4. Name of final certificate
Semester	5. Study system:
None	Annual/Courses/Other
Internet	6. Accredited accreditation rogram
1/9/2022	7. Other external influences

1. Academic Program Objectives

Preparing specialists who are familiar with the basics of chemistry theoretically and practically, capable of meeting the needs of the labor market, in addition to teaching chemistry to students of other departments in the College of Science. Conducting scientific research and trying to keep pace with the scientific development of chemistry. Cooperating with state institutions and the private sector by providing scientific advice and consultation and conducting chemical analyses.

1. مخرجات البرنامج المطلوبة وطرائق التعليم والتعلّم والتقييم

1. Required program outcomes, teaching, learning and evaluation methods

A- Cognitive objectives.

A1- Enabling students to gain knowledge and understanding of the intellectual framework of chemistry

A2- Enabling students to gain knowledge and understanding of international chemical standards

A3- Enabling students to gain knowledge and understanding of the laws of chemistry

A4- Enabling students to gain knowledge and understanding of the standards of chemical analysis

A5- Enabling students to gain knowledge and understanding of the law of misuse of chemicals
A6- Enabling students to gain knowledge and understanding of chemistry systems
A7- Enabling students to gain knowledge and understanding of chemistry in English

B- Program specific skill objectives:
B1- Scientific and practical skills
B2- Recall and analysis skills
B3- Use and development skills

Teaching and learning methods

Providing students with the basics and topics related to knowledge and systems explained in:
1- Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using (LCD) and (Data show) screens
2- Providing students with knowledge through assignments Homework for school vocabulary
3 - Asking students to visit the library to gain academic knowledge related to school vocabulary
4 - Improving students' skills by visiting websites to gain additional knowledge of school subjects

Evaluation methods

Daily tests with multiple-choice questions for school subjects
- Participation grades for difficult competitive questions for students
- Setting grades for assigned homework
- Qualitative and quantitative practical tests in laboratories

C- Emotional and value-based objectives:
C- Thinking skills and scientific problem-solving skills
C 1 - Enabling students to solve problems related to the intellectual framework of chemistry
C 2 - Enabling students to solve problems related to international chemistry standards
C 3 - Enabling students to solve problems related to the laws of control and quality of chemistry
C 4 - Enabling students to solve problems related to chemistry and in the English language

Teaching and learning methods

Providing students with the basics and additional topics related to the previous educational outcomes for problem-solving skills
Scientific
- Solving a set of practical examples by the academic staff
- Asking students During the lecture to solve some scientific issues

Evaluation methods

- Daily exams with multiple-choice questions that require scientific skills
- Daily exams with scientific and practical questions
- Participation grades for competition questions for academic topics
- Setting grades for homework
- Assigning students to do scientific seminars and discuss them

D - General and transferable qualification skills (other skills related to employability and personal development).
D1 - Enabling students to think and analyze topics related to the intellectual framework and international chemical standards
D2 - Enabling students to think and analyze topics related to company laws and chemical auditing standards
D3 - Enabling students to think and analyze topics related to language systems for importing chemicals
D4 - Enabling students to think and analyze topics related to chemistry in English
Teaching and learning methods

Providing students with the basics and additional topics related to the outputs of thinking and chemical analysis
- Forming discussion groups during lectures to discuss chemical topics that require thinking and analysis
- Asking students to ask a set of thinking questions during lectures such as what, how, when and why
for specific topics
- Giving students homework that requires self-explanations in causal ways

Evaluation methods

Daily exams with self-solved homework questions
- Participation grades for competitive questions related to the subject matter

- Specific grades for homework

Credit hours		Course name	Course code	Academic stage
practical	theoretical			
-	2	Analytical Chem.1 (Gravimetric analysis)	101 ChAC	**First stage**
-	2	Inorganic Chemistry (1)	102 ChIC	
2	2	Physics (1)	103 P	
2	1	Computer Science (1)	104 CS	
2	2	Geology (1)	105 GS	
-	2	Mathematics (1)	106 M	
-	1	Human Rights	107 HR	
-	2	Analytical Chem.2 (Volumetric Analysis)	108 ChSS	
-	1	Chemical Safety & Security (1)	109 ChAC	
4	-	Practical Analytical Chem.1 (qualitative & quanitative Analysis)	110 ChAC	
-	2	Inorganic Chemistry (2)	111 ChIC	
2	2	Physics (2)	112 P	
2	1	Computer Science (2)	113 CS	
2	2	Geology (2)	114 GS	
-	2	Mathematics (2)	115 M	
-	1	Democracy & Freedom	11 6 DF	
-	2	Analytical Chem. 3 (Organic Reagents &Thermal Analysis)	218 ChAC	**Second stage**
4	-	Practical Analytical Chem.2 (Separation technique)	219 ChPsT	
-	2	Inorganic Chemistry (3)	220 ChIC	
-	2	Physical Chemistry (1)	221 ChPC	
4	-	Practical Physical Chemistry (1)	222 ChPp	
-	2	Organic Chemistry (1)	223 ChOC	
-	2	Mathematics (3)	224 M	
2	1	Computer Science (3)	225 CS	
-	2	Analytical Chem. 4 (Separation Technique)	226 ChAC	

4	-	Practical Inorganic Chemistry (1)	227 ChPI	
-	2	Inorganic Chemistry (4)	228 ChIC	
-	2	Physical Chemistry (2)	229 ChPC	
-	2	Organic Chemistry (2)	230 ChOC	
4	-	Practical Organic Chemistry (1)	231 ChPO	
-	2	Mathematics (4)	232 ChM	
-	2	Inorganic Chemistry (5)	333 ChIC	**Third stage**
4	-	Practical Inorganic Chemistry (2)	334 ChPI	
-	2	Organic Chemistry (3)	335 ChOC	
4	-	Practical Organic Chemistry (2)	336 ChPO	
-	2	Physical Chemistry (3)	337 ChPC	
3	2	Biochemistry (1)	338 ChBC	
-	2	Industrial Chemistry (1)	339 ChIN	
-	2	Nano Chemistry (1)	340 ChNC	
-	2	Inorganic Chemistry (6)	341 ChIC	
-	2	Organic Chemistry (4)	342 ChOC	
-	2	Physical Chemistry (4)	343 ChPC	
4	-	Practical Physical Chemistry (2)	344 ChPpC	
3	2	Biochemistry (2)	345 ChBC	
-	2	Industrial Chemistry (2)	346 ChIN	
3	2	Radio Chemistry	347 ChRC	
-	2	Quantum & Spectroscopy (1)	448 ChQS	**Fourth stage**
3	2	Instrumental Analysis (1)	449 ChIA	
3	2	Biochemistry (3)	450 ChBC	
-	2	Polymer Science (1)	451 ChPS	
-	2	Petro Chemistry (1)	452 ChPT	
2	-	Research Projects	453 RP	
-	2	Identification Organic Compounds	454 ChIO	
4	-	Practical Identification of Organic Compounds	455 ChPiO	
-	2	Quantum & Spectroscopy (2)	456 ChQS	
3	2	Instrumental Analysis (2)	457 ChIA	
3	2	Biochemistry (4)	458 ChBC	
2	2	Polymer Science (2)	459 ChPS	
2	2	Petro Chemistry (2)	460 ChPT	
2	-	Research Projects	461 RP	
-	2	Nano chemistry (2)	462 ChNC	

1. Planning for personal development

- Follow up on scientific development by contacting international universities via the Internet
- Participation in scientific conferences inside and outside Iraq
- Participation in scientific workshops and seminars inside and outside Iraq
- Field visits to industrial projects

2. Admission criteria (setting regulations related to joining the college or institute)

Central - Scientific
According to the requirements of the Ministry of Higher Education and Scientific Research so that it matches the latest admission requirements in Iraqi universities

3. The most important sources of information about the program
- University requirements
- Local scientific trends
- Global scientific requirements
- Coverage of the specialized staff locally

Curriculum Skills Map																		
Please tick the boxes corresponding to the individual programme learning outcomes being assessed																		
Required Programme Learning Outcomes																		
General and transferable skills (other skills related to employability and personal development)				**Emotional and value goals**				**Program specific skill objectives**				**Cognitive objectives**				**Essential or optional**	**Course name**	**Course code**	**Year/Level**
د4	د3	د2	د1	ج4	ج3	ج2	ج1	ب4	ب3	ب2	ب1	أ4	أ3	أ2	أ1				
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Analytical Chem.1 (Gravimetric analysis)	101 ChAC	**First stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Inorganic Chemistry (1)	102 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Physics (1)	103 P	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Computer Science (1)	104 CS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Geology (1)	105 GS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Mathematics (1)	106 M	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Human Rights	107 HR	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Analytical Chem.2 (Volumetric Analysis)	108 ChSS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Chemical Safety & Security (1)	109 ChAC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Analytical Chem.1 (qualitative & quanitative Analysis)	110 ChAC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Inorganic Chemistry (2)	111 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Physics (2)	112 P	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Computer Science (2)	113 CS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Geology (2)	114 GS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Mathematics (2)	115 M	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Democracy & Freedom	11 6 DF	
																Basic			

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Analytical Chem. 3 (Organic Reagents &Thermal Analysis)	218 ChAC	**Second stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Analytical Chem.2 (Separation technique)	219 ChPsT	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Inorganic Chemistry (3)	220 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Physical Chemistry (1)	221 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Physical Chemistry (1)	222 ChPp	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Organic Chemistry (1)	223 ChOC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Mathematics (3)	224 M	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Computer Science (3)	225 CS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Analytical Chem. 4 (Separation Technique)	226 ChAC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Inorganic Chemistry (1)	227 ChPI	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Inorganic Chemistry (4)	228 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Physical Chemistry (2)	229 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Organic Chemistry (2)	230 ChOC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Organic Chemistry (1)	231 ChPO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Mathematics (4)	232 ChM	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Inorganic Chemistry (5)	333 ChIC	**Third stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Inorganic Chemistry (2)	334 ChPI	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Organic Chemistry (3)	335 ChOC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Organic Chemistry (2)	336 ChPO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Physical Chemistry (3)	337 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Biochemistry (1)	338 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Industrial Chemistry (1)	339 ChIN	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Nano Chemistry (1)	340 ChNC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Inorganic Chemistry (6)	341 ChIC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Organic Chemistry (4)	342 ChOC	

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Physical Chemistry (4)	343 ChPC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Physical Chemistry (2)	344 ChPpC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Biochemistry (2)	345 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Industrial Chemistry (2)	346 ChIN	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Radio Chemistry	347 ChRC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Quantum & Spectroscopy (1)	448 ChQS	**Fourth stage**
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Instrumental Analysis (1)	449 ChIA	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Biochemistry (3)	450 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Polymer Science (1)	451 ChPS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Petro Chemistry (1)	452 ChPT	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Research Projects	453 RP	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Identification Organic Compounds	454 ChIO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Practical Identification of Organic Compounds	455 ChPiO	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Quantum & Spectroscopy (2)	456 ChQS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Instrumental Analysis (2)	457 ChIA	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Biochemistry (4)	458 ChBC	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Polymer Science (2)	459 ChPS	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Petro Chemistry (2)	460 ChPT	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Research Projects	461 RP	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Basic	Nano Chemistry (2)	462 ChNC	

Course Description Form
For the Third Stage

First Semester

2022-2023

Course Description / Inorganic Chemistry 5

This course description provides basic theoretical models and their properties, and the techniques needed to prove those theories in practical or more advanced experimental terms. Students will be able to stand up to interpret and find solutions to the requirements.

University of Baghdad-College of Science	1. Educational institution
Chemical Sciences	2. Academic department/center
Coordination Chemistry/Inorganic 5333 ChIC/	3. Course name/code
In-person	4. Available forms of attendance
First/2023-2022	5. Semester/year
= 15 x 230 Hours	6. Number of study hours (total)
9/1/2022	7. Date this description was prepared

Course objectives .1

The theoretical foundations of inorganic chemistry have expanded considerably in recent years. The aim of this course is to study the basic theories and foundations on which inorganic chemistry is built. The course introduces basic theoretical models and their properties, and the techniques needed to prove those theories in practical or more advanced experimental terms. Students will be able to stand on the interpretation and find solutions to the requirements. Students are expected to become theoretically experienced to support and enhance the practical side of the main topics, and to have the opportunity to explore real-world topics in this field.

Course outcomes, teaching, learning and assessment methods .2

A- Cognitive objectives

A1- Clarifying the basic concepts and theories on which inorganic chemistry was built or founded.

A2- Acquiring skills in dealing with the problem.

A3- Acquiring basic skills as an introduction to building.

A4- Acquiring theoretical concepts for dealing with data and employing it in pre-prepared software to obtain information sufficient to reach knowledge of the compounds to be prepared according to scientific foundations.

B - Course specific skill objectives

B1 - The ability to think about solving the problem according to specific rules by using the method or The creative and deductive method and avoiding the rote and rote method.

B2 - Writing scientific reports.

B3 - Knowing the connection between the theoretical and practical curriculum.

Teaching and learning methods
Adopting blended learning (direct learning using the blackboard and display screen and e-learning using multiple programs that ensure fruitful communication between the teacher and the student).
Evaluation methods
- Readings, self-learning, discussion groups. - Training and activities in the classroom. - Guiding students to some websites to benefit from them to develop capabilities. - Holding research seminars through which some problems are explained and analyzed and the mechanism for finding solutions for them. - Conducting written tests and interactive oral dialogues in almost every lecture. - In addition to monthly exams and final exams. -
C- Emotional and value-based objectives
C1- Ensuring that the student understands the prescribed materials and desires to learn them through interaction with the teacher and the material
Teaching and learning methods
Using teaching methods that develop mental and creative thinking in students, transcending the traditional method (memorization and indoctrination).
Evaluation methods
- Encouraging students to borrow scientific resources from the department or college library to review the study topic. - Assigning students to review what is published about the semester topic through the Internet. - Opening horizons for the student to think about investing the prepared compounds in many fields that serve the community
D- General and transferable skills (other skills related to employability and personal development).
D1- Using modern sources D2- Using alternative methods that replace scarce materials D3- Using important notes from experts and supervising professors

10. Course structure

Evaluation Method	Teaching Method	Unit Name / Topic	Required learning outcomes	hours	week
Monthly exam, daily exam and discussion within the lecture	Using Blended Learning	Classification of Elements in the Periodic Table, Introduction to Coordination Compounds		2	1
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	Emergence of Coordination Theories		2	2
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	(Chain Theory and Werner Coordination Theory)		2	3

Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	To be continued.....		2	4
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	Classes of ligands and isomerism		2	5
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	Naming coordination compounds		2	6
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	To be continued.....		2	7
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	Lewis theory-electron equivalence principle		2	8
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	First monthly exam (written)		2	9
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	Classification of complexes magnetically and spectrum symbols		2	10
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	Theories of coordination compounds (complexes) Valence bond theory		2	11
Monthly Exam, Daily Exam, and Discussion in Lecture	Using Blended Learning	To be continued.....	.	2	12
Monthly Exam, Daily Exam, and Discussion in	Using Blended Learning	Applications of formation of chelated complexes and the importance and use of coordination compounds		2	13
Monthly Exam, Daily Exam, and Discussion in	Using Blended Learning	Metallic carbonyl compounds		2	14
Monthly Exam, Daily Exam, and Discussion in	Using Blended Learning	First monthly exam (written)		2	15

	11. Infrastructure
Theoretical coordination chemistry book - the curriculum	• Required textbooks
Theoretical coordination chemistry books - internationally approved	• Main references (sources)
1. Inorganic Chemistry, J. E. Huheey, E. A. Keiter, R. L. Keiter,(4th edn.), 1993	• Recommended books and references (scientific journals, reports, etc.)
2. Basic Inorganic Chemistry, E. A. Cotton, G. Wilkinson, (3rd edn.) 1995, Wiley interns Edition	• Electronic references, Internet sites.
Scientific journals, periodicals and research in the specialty	• Required textbooks
	12. Curriculum development plan
	- Developing the academic content by deleting, adding

and replacing according to administrative procedures.
- Using modern teaching methods according to the nature of the subject and the level of learners from time to time.
- Using modern assessment tools that the student interacts with and at the same time keeps him away from the atmosphere of boredom and repetition.
- Field visits to some scientific research institutions related to the subject of the curriculum to consolidate what is learned in the semester and to see the methods directly in person.

Course Description / Inorganic Chemistry (Practical) 2

This course description provides knowledge of the meaning of transition elements, recognition of the chemical properties of transition elements, recognition of the coordination complex, who it is formed from, what is its role in life, why we study coordination complexes, recognition of the basic elements that form complexes, their types, theories that explain complexes, their formation, and the basics on which they are based. Areas of strength and weakness in the theories

University of Baghdad	1. Educational institution
Chemistry	2. Academic department/center
Inorganic Chemistry Laboratory 2-334 ChPI	3. Course name/code
Weekly attendance	4. Available forms of attendance
First / 2023-2022	5. Semester/year
hours60 = 15 x hours 4	6. Number of study hours (total)
9/1/2022	7. Date this description was prepared
Course objectives .1	

To provide students with knowledge of coordination chemistry and link it to previous information about inorganic chemistry for the two stages and the development that occurred in inorganic chemistry, to provide students with knowledge of the meaning of transition elements, to learn about the chemical properties of transition elements, to learn about the coordination complex, who it is formed from, what is its role in life, why we study coordination complexes, to learn about the basic elements that make up complexes and their types, and the theories that explain complexes, their formation, and the basics on which they are based. Areas of strength and weakness in the theories, what is the benefit of studying these theories and what is their role in life

1. Course Outcomes, Teaching, Learning and Evaluation Methods
2. A- Cognitive Objectives
3. A1- Clarifying the basic concepts and theories on which inorganic chemistry was built or founded.
4. A2- Acquiring skills in dealing with the problem.
5. A3- Acquiring basic skills as an introduction to building.
6. A4- Acquiring theoretical concepts for dealing with data and employing them in pre-prepared software to obtain information sufficient to reach knowledge of the compounds to be prepared according to scientific foundations.
7. B- Course Skill Objectives
8. B1- The ability to think about dealing with the problem according to specific rules by using the creative and deductive method or method and avoiding the rote and rote method.
9. B2- Writing scientific reports.
10. B3- Knowing the link between the theoretical course and the practical course..
11. Teaching and Learning Methods.
12. Adopt blended learning (direct learning through the use of the blackboard and display screen and e-learning using برامج متعددة كفيلة للتواصل المثمر بين الأستاذ والطالب).

Evaluation Methods

- Readings, self-learning, discussion groups.
- Training and activities in the classroom.
- Guiding students to some websites to benefit from them to develop capabilities.
- Holding research seminars through which some problems are explained and analyzed and the mechanism for finding solutions to them.

Conducting written tests and oral dialogues in almost every lecture.

In addition to monthly exams and final exams.

C- Emotional and value objectives

C1- Ensuring that the student understands the prescribed materials and desires to learn them through interaction with the professor and the material

Teaching and learning methods

Using teaching methods that develop mental and creative thinking in students, transcending the traditional method (memorization and indoctrination).

Evaluation Methods

- Urging students to borrow scientific sources from the department or college library to review the subject of study.
- Assigning students to review what is published about the subject of the semester through the Internet.
- Opening horizons for the student to think about investing the prepared vehicles in many fields that serve the community

D- General and transferable qualification skills (other skills related to employability and personal development).

D1- Using modern sources

D2- Using alternative methods that eliminate scarce materials

D3- Using important notes from experts and supervising professors

10. Course structure

Evaluation method	Teaching Method	Unit Name / Topic	Required learning outcomes	hours	Week
		Group Divide Students with Lab Instructions		4	1
Quizat + direct questions for students	Paper and electronic lectures and practical experiments	Vanadium Chemistry		4	2
		Vanadium Chemistry		4	3
Quizat + direct questions for students For students Through the electronic class	Paper and electronic lectures and conducting practical experiments	chromium chemistry		4	4
					5
Quizzes + direct questions for students Through the electronic class	Paper and electronic lectures and conducting practical experiments	Nickel Chemistry		4	6
					7

Quizzes + direct questions for students	Paper and electronic lectures and conducting practical experiments	Copper Chemistry		4	8
					9
Quizzes + direct questions for students		General Review of Experiments		4	10
Through the electronic class	Paper and electronic lectures and conducting practical experiments	Final Exam			11

	.11- Infrastructure

A notebook in practical inorganic chemistry	• Required textbooks
A book on practical coordination chemistry	• Main references (sources)
Scientific journals, periodicals and research in the specialty	• Recommended books and references (scientific journals, reports, etc.)
Internet sites, Google, YouTube and social media in the specialty.	• Electronic references, Internet sites

12. Curriculum development plan
- Developing the educational content by deleting, adding and replacing. - Using modern teaching methods according to the nature of the subject and the level of the learners from time to time. - Using modern assessment tools that the student interacts with and at the same time keeps him away from the atmosphere of boredom and repetition

Course Description / Organic Chemistry 3

This course description enables students to know the basics of organic chemistry and delve into deeper details in the field of organic synthesis of organic compounds, how to diagnose them, and study their potential applications.

1. Educational institution	Ministry of Higher Education and Scientific Research
2. Academic department/center	College of Science/Department of Chemistry/University of Baghdad
3. Course name/code	Organic Chemistry /3/ 335 ChOC
4. Available forms of attendance	In-person
5. Semester/year	First/ 2023-2022
6. Number of study hours (total)	30 hours = 15 x 2 hours
7. Date this description was prepared	1/9/2022

1. Course objectives: Teaching students important basics in organic chemistry

Enabling students to know the basics of organic chemistry and delve into deeper details in the field of organic synthesis of organic compounds and the method of diagnosing them and studying their potential applications

1. Course Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive Objectives

A1- Explaining the material using audio and video methods to enable the student to understand it correctly

A2- Providing the student with the material on paper as well so that he can review it simultaneously during the lecture explanation by marking the paper file

A3- Asking questions and inquiries to the students to create an interactive environment between the students

A4- Conducting daily and monthly exams for the students with daily assignments to enable the student to understand the material more

A5- Giving topics to the students within the curriculum vocabulary to prepare a comprehensive report on the vocabulary specific to the course to increase the extent of students' comprehension of the vocabulary by viewing electronic and paper sources

B - Course specific skill objectives

B1 - Teaching students the correct way to search for sources that they use to prepare the required reports by browsing electronic websites or paper books or those available in electronic PDF format

B2 - Guiding the student on how to write and prepare scientific research that can be used in the future

Teaching and learning methods

Electronic methods by presenting the lecture in the form of audio videos and paper PDF

Evaluation methods

1. Student attendance

2. Conducting daily and monthly exams as well as evaluating students through interaction with the material and discussion regarding the material

3. Requesting daily assignments and monthly reports

C- Emotional and value-based goals

C1- Teaching students to serve the nation and society

C2- Preparing a distinguished generation of graduates

D- General and transferable qualification skills (other skills related to employability and personal development).
D1- Online training on various programs
D2- Preparing questions appropriate to the current situation and electronic study

Course structure .1

Evaluation Method	Teaching Method	Unit name / or topic	Required Learning Outcomes	hours	Week
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Nomenclature of aldehydes and ketones, their physical properties and preparation	Aldehydes and Ketones	4	First
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Preparation and reactions of aldehydes and ketones	Aldehydes and Ketones	4	Second
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Nomenclature of carboxylic acids, their physical properties and preparation	Carboxylic Acids	4	Third
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Preparation and reactions of carboxylic acids	Carboxylic Acids	4	Fourth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Nomenclature of carboxylic acid derivatives, their physical properties and preparation	Carboxylic Acids	4	Fifth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Preparation and reactions of carboxylic acid derivatives	Carboxylic Acid Derivatives	4	Sixth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Stereochemistry, stereoisomers, optical activity, specific rotation, enantioselectivity and optical activity	Stereochemistry	4	Seventh
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Racemic mixture, formula (R,S), antinodes and meso forms	Stereochemistry	4	Eighth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Generation of chiral center, reaction of chiral molecules (breaking bond)	Stereochemistry	4	Ninth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Reaction of chiral molecules (maintaining arrangement, generation of new chiral center), reaction of active molecules with optically active reagents (separation)	Stereochemistry	4	Tenth

Attendance, Homework, Exams and Reports	Paper and electronic lectures	Carbon negative ion (1): alpha hydrogen acidity, aldol condensation and intersection Aldol	Carbane Negative 1	4	Eleventh
Evaluation Method	Paper and electronic lectures	Reactions related to aldol condensation, Fatak reaction			Twelfth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Claisen condensation and Claisen intersection, Reformatsky reaction		4	Thirteenth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	Negative carbon ion (2): Malonic ester for the preparation of carboxylic acids, acetoacetic ester for the preparation of ketones	Negative carbane 2	4	Fourteenth
Attendance, Homework, Exams and Reports	Paper and electronic lectures	All carbonyl compounds by imine	Imine	4	Fifteenth
		Final exam			

Curriculum development plan .2
By creating a new mechanism that is compatible with the reality of e-learning in Iraq (using new methods in presenting the lecture)

Infrastructure .3	
Morrison and Boyd 6 addition	Required textbooks
Electronic lectures prepared in PDF format and audio video lectures	
Various sources from the Internet	(Recommended books and references)(scientific journals, reports, etc.)
Various sources from the Internet	(Electronic reference, websites, etc.)

Course Description / Organic Chemistry (Practical) 2

This course description provides the diagnosis of organic materials and the preparation of chemical materials at this stage and thus the understanding of industrial materials and petrochemical materials at the advanced stages of their study.

1. Educational institution	Ministry of Higher Education and Scientific Research
2. University department/center	College of Science, Department of Chemistry / University of Baghdad
3. Course name/code	Practical Organic Chemistry (2) 336 ChPO
4. Programs in which it is included	Organic Chemistry Laboratory
5. Available forms of attendance	Weekly in-person
6. Semester/year	First / 2023-2022
7. Number of study hours (total)	60 hours = 15 x 4 hours
8. Date this description was prepared	1/9/2022
1. Course Objectives	
Building students with a foundation in organic chemistry that qualifies them to understand the material	
In terms of diagnosing organic materials and preparing chemical materials at this stage and thus understanding industrial materials and petrochemical materials in the advanced stages of their studies	
2. Learning outcomes and teaching, learning and assessment methods	
A- Cognitive objectives A1- Practical organic chemistry, part one How to conduct experiments, prepare materials and discoveries about effective groups	
B - Course specific skill objectives	
B1 - Innovating short and fruitful work methods	
B2 - Facilitating the subject with planning and simplified methods	
Teaching and learning methods	
Practical methods for conducting chemical experiments using chemical materials and laboratory equipment	
Evaluation methods Using reports submitted by students for the experiments carried out and short exams as well as daily evaluation of the student's technique and diagnosis to find the given solutions as unknowns C- Emotional and value objectives C1- Finding a practical and practical technique for the student to understand clearly and understandably C2- Training the student on known models C3- Finding stimulating questions that help in understanding and comprehension C4- Giving the student unknowns to ensure the extent of his comprehension	
Evaluation methods	
Grades are given for the technique used by the student as well as for commitment to attendance and adherence to controls and for the product as well as the weekly report submitted by him D - General and transferable qualification skills (other skills related to employability and personal development). D1- Use of modern sources D2- Use of alternative methods that replace scarce materials D3- Use of important notes from experts and supervising professors	

Course structure					
Evaluation Method	Teaching Method	Name of Unit / Course or Topic	Required Learning Outcomes	الساعات	week
Exams, Reports and Attendance	Using Chemicals and Scientific Equipment	Guidelines and Chemical Safety and Security	Chemical Safety and Security Guidelines	4	1
Exams, Reports and Attendance	Using Chemicals and Scientific Equipment	Cyclohexane	Cyclohexanone	4	2
Exams, Reports and Attendance	Using Chemicals and Scientific Equipment	Preparation and Identification of Acids	Adipic acid	4	3
Exams, Reports and Attendance	Using Chemicals and Scientific Equipment	Preparation and Identification of Ester	Di-methyl adipate	4	4
Exams, Reports and Attendance	Using chemicals and scientific equipment	Phenyl azo beta-naphthol	Azo dyes	4	5
Exams, Reports and Attendance	Using chemicals and scientific equipment	Phenyl azo beta naphthol reduction	Reduction	4	6
Exams, Reports and Attendance	Using chemicals and scientific equipment	Diisoaminobenzene	Diazo	4	7
Exams, Reports and Attendance	Using chemicals and scientific equipment	Methyl orange	Azo as indicator	4	8
		Final exam			9

11. Infrastructure	
Practical Organic Chemistry	Required textbooks
Including Qualitative Organic Analysis	
By Arthur I. Vogel, D.Sc.(Lond.),D.I-C.,F. In addition to a notebook prepared by us Numerous and varied and included in the performance evaluation form Attendance at many cultural and scientific lectures conducted by the departmentR.I.C.	(Recommended books and references)(scientific journals, reports, etc.)
Various sources from the Internet	(Electronic reference, websites, etc.)

12. Curriculum development plan
By creating a new mechanism that is compatible with the reality of e-learning in Iraq (using new methods in presenting the lecture)

Course Description / Physical Chemistry 3

The course description provides those who are familiar with the basics of chemistry, theoretically and practically, and are able to meet the needs of the labor market in addition to teaching chemistry to students of other departments in the College of Science.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
337 ChPC /Physical Chemistry(3)	3. Course name/code
In-person	4. Available forms of attendance
First 2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
1 / 9 /2022	7. Date this description was prepared

1. Course Objectives

Preparing specialists who are familiar with the basics of chemistry theoretically and practically, capable of meeting the needs of the labor market, in addition to
Teaching chemistry to students of other departments in the College of Science.

Conducting scientific research and trying to keep pace with the scientific development of chemistry.

Cooperating with state institutions and the private sector by providing scientific advice and consultation and conducting chemical analyses.

1. Course Outcomes and Teaching, Learning and Evaluation Methods

A- Cognitive Objectives.

A1- Enable students to gain knowledge and understanding of the intellectual framework of chemistry
A2- Enable students to gain knowledge and understanding of international chemical standards
A3- Enable students to gain knowledge and understanding of the laws of chemistry
A4- Enable students to gain knowledge and understanding of the standards of chemical analysis
A5- Enable students to gain knowledge and understanding of the law of misuse of chemicals
A6- Enable students to gain knowledge and understanding of chemistry systems Enable students to gain knowledge and understanding of chemistry in English

B- Course Skill Objectives

B1- Scientific and Practical Skills
B2- Recall and Analysis Skills
B3- Use and Development Skills

Teaching and learning methods

Providing students with the basics and topics related to knowledge and systems explained in:

1 - Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using LCD screens and (Data show)

2- Providing students with knowledge through homework assignments for study vocabulary

3 - Asking students to visit the library to obtain academic knowledge related to study vocabulary

- Improving students' skills by visiting websites to obtain additional knowledge for study materials

5- E -LEARNING and google classroom

Evaluation methods

Daily tests with multiple-choice questions for study materials

- Participation grades for difficult competitive questions for students

- Setting grades for assigned homework assignments

- Qualitative and quantitative practical tests in laboratories

C- Emotional and value objectives

C- Thinking skills and scientific problem-solving skills

C 1 - Enabling students to solve problems related to the intellectual framework of chemistry

C 2 - Enabling students to solve problems related to international chemistry standards

C 3 - Enabling students to Solving problems related to the laws of control and quality of chemistry

C4 - Enabling students to solve problems related to chemistry and in English

Teaching and learning methods

Providing students with the basics and additional topics related to the previous educational outcomes of problem-solving skills

Scientific

- Solving a set of practical examples by the academic staff

- Asking students during the lecture to solve some scientific problems

Evaluation methods

- Daily exams with multiple-choice questions that require scientific skills

- Daily exams with scientific and practical questions

- Participation grades for competition questions for academic topics

- Setting grades for homework

- Assigning students to do scientific seminars and discuss them

D - General and transferable qualification skills (other skills related to employability and personal development).
D1 - Enable students to think and analyze topics related to the intellectual framework and international chemical standards
D2 - Enable students to think and analyze topics related to company laws and chemical audit standards
D3 - Enable students to think and analyze topics related to language systems for importing chemicals

D4 - Enable students to think and analyze topics related to chemistry in English

Course structure .1

Evaluation Method	Teaching Method	Unit name/topic	Required Learning Outcomes	hours	Week
Semester and Daily Exams	Paper and electronic lectures	Physical chemistry3	Introduction to Physical Chemistry Kinetics / Types of Chemical Reaction Rates with Application Examples	4	1st and 2nd
Semester and Daily Exams	Paper and electronic lectures	Physical chemistry3	Velocity Units + Laws of Chemical Reaction Rates + Application Examples	4	3rd and 4th
Semester and Daily Exams	Paper and electronic lectures	Physical chemistry3	Orders of Chemical Reactions + Zero Order + False Suspicious + Application Examples	4	5th and 6th
Semester and Daily Exams	Paper and electronic lectures	Physical chemistry3	Orders of Reactions / First Order + Second Order + Application Examples	4	7th and 8th
Semester and Daily Exams	Paper and electronic lectures	Physical chemistry3	Orders of Reactions / Third Order with Application Examples + Constant Units	4	9th and 10th
Semester and Daily Exams	Paper and electronic lectures	Physical chemistry3	Half-life with Application Examples + How to Calculate Chemical Reaction Ranks	4	11th and 12th
Semester and Daily Exams	Paper and electronic lectures	Physical chemistry3	Kinetic Chemistry Theories / Collision Theory with Application Examples	4	Thirteenth and fourteenth
			Final exam		fifteenth

1. Infrastructure	
Essential of Physical Chemistry Fundamental of Physical Chemistry	• Required textbooks
Essential of Physical Chemistry Fundamental of Physical Chemistry	• Main references (sources)
Fundamental of Physical chemistry	• Recommended books and references (scientific journals, reports, etc.)
Sites related to physical chemistry	• Electronic references, websites

1. Curriculum development plan
According to the requirements of the Ministry of Higher Education and Scientific Research, so that it is consistent with the latest local scientific trends and global scientific requirements.

Course Description / Industrial Chemistry 1

This course description provides applications in chemistry and study of theoretical industrial chemistry and industrial applications of chemistry and laboratories and the extent to which students benefit from the practical aspect and apply it in practical life after graduation. New industrial topics have been introduced to keep pace with scientific development.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Industrial Chemistry-1 / 339 ChIN	3. Course name/code
Weekly in-person	4. Available forms of attendance
First semester 2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
1 /9 /2022	7. Date this description was prepared

1. Course objectives

Applications in chemistry and study of theoretical industrial chemistry and industrial applications of chemistry and laboratories and the extent to which students benefit from the practical aspect and apply it in practical life after graduation. New industrial topics have been introduced to keep pace with scientific development. Participation in the electronic class for all students and conducting exams, assignments and quizzes and creating industrial reports contribute to calculating effort and interaction in the electronic class. These are among the topics that were studied in the first course.

Physical processes used in chemical industries. -1
mechanical separation methods. -2
Electrostatic and magnetic separation methods. -3
Magnetic separation. -4
Thermal of Separation methods: -5
Chemical Processes Technology. -6
Types of chemical operation processes -7

Catalysts. -8
Methods of preparation of catalysts. -9
Conversion, Efficiency and Yield. -10
Industrial Production 1-Ammonia -11
Industrial Products 2- Nitric Acid. -12
Urea. -13

1. Course Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive Objectives

A1- Study the applications of industrial chemistry and the extent of their future benefit in factories to serve the country.

A2- Identify the devices used in manufacturing and benefit from them in industry

A3- Accustom students to rely on their abilities in the benefit of chemical industries to serve the country.

A4- Teaching students to respect the time allocated to them in electronic classes

A5- Teaching students to take care of devices and their uses inside factories.

B- Course Skill Objectives

B1--. Theoretical applications of industrial chemistry practically in laboratories and the extent of their benefit in manufacturing.

B2- Introducing modern topics related to the curriculum for the academic year.

B3- Teaching students to expand their industrial thinking using modern means of communication from the Internet and benefit from them.

B4- Commitment to professors' instructions, respecting time and teaching students to participate in the electronic class.

Teaching and learning methods

Detailed explanation of industrial topics and providing general information related to industry and increasing production and theoretical explanation with calculations and clarifying them in the electronic class with conducting the quzz, reports and assignments. The lectures were explained in the electronic class with picture and sound.

Evaluation methods

1- Daily exams and weekly assignments.

2- Weekly reports

3- Evaluating students on their behavior and the extent of their respect for time as well as their participation in the electronic class.

C- Emotional and value goals

C1-- Evaluating outstanding students and encouraging them to continue to excel

C2- Participating students in solving their problems

C3- Helping them correct the mistakes they go through as much as possible

Teaching and learning methods

Through lectures in the class and learning to use special measuring devices. As well as explaining industrial topics theoretically in the electronic class and conducting the quzz and weekly assignments and submitting reports on the experiments for the purpose of calculating students' efforts.

Evaluation Methods

1- Weekly Exams

2- Weekly Reports

1- Submitting weekly assignments for the purpose of calculating the effort.

D- General and transferable qualification skills (other skills related to employability and personal development).

D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them.

D2- Developing personal skills by reciting poetry debates through their participation in central celebrations held within the university.					
Course structure .1					
Evaluation Method	Teaching Method	Unit name/topic	Required learning outcomes	Hours	Week
	Theoretical and Online Teaching	1-Physical processes used in chemical industries. 2-mechanical separation methods. 3-Electrostatic and magnetic separation method 4--agnetic separation. 5-Thermal of Separation methods:	Theoretical and electronic teaching	4 hours	1st, 2nd, 3rd, 4th
Cues with weekly reports and weekly assignments.	Theoretical and Online Teaching	2-Chemical Processes Technology. 7--Types of chemical operation processes 8-Catalysts.	Theoretical and electronic teaching		6th, 7th, 8th, 9th
	Theoretical and electronic teaching Theoretical and electronic teaching	9-Methods of preparation of catalysts. 10-Conversion, Efficiency and Yield. 11-Industrial Production 1-Ammonia	Theoretical and electronic teaching Theoretical and electronic teaching		10th, 11th, 12th
	Theoretical and electronic teaching Theoretical and electronic teaching	12-Industrial Products 2- Nitric Acid. 13-Urea.	Theoretical and electronic teaching Theoretical and electronic teaching		13th, 14th
		Student exam			15th

Infrastructure .2	
Industrial chemistry by Johan k.M. The book of the foundations of industrial chemistry by Professor Muhammad Magdy Wasil Al-Fareed Electronic Library	• Required textbooks
Industrial chemistry book supervised by Prof. Hoda Najm El-Din	• Main references (sources)
Hand book of industrial chemistry. By Mohammad Farhat Ali.	• Recommended books and references (scientific journals, reports, etc.)
All websites related to industrial topics	• Electronic references, Internet sites

1. Curriculum development plan
We have developed scientific topics and introduced new topics to make students understand industries and their benefits to society in ways that keep pace with new scientific developments and develop the foundations of education in electronic classes and participate in them in activities, exams and daily assignments.

Course Description / Industrial Chemistry 1

This course description provides applications in chemistry and study of theoretical industrial chemistry and industrial applications of chemistry and laboratories and the extent to which students benefit from the practical aspect and apply it in practical life after graduation. New industrial topics have been introduced to keep pace with scientific development.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Industrial Chemistry-1 / 339 ChIN	3. Course name/code
Weekly in-person	4. Available forms of attendance
First semester 2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
1 /9 /2022	7. Date this description was prepared
	1. Course objectives

Applications in chemistry and study of theoretical industrial chemistry and industrial applications of chemistry and laboratories and the extent to which students benefit from the practical aspect and apply it in practical life after graduation. New industrial topics have been introduced to keep pace with scientific development. Participation in the electronic class for all students and conducting exams, assignments and quizzes and creating industrial reports contribute to calculating effort and interaction in the electronic class. These are among the topics that were studied in the first course.

Physical processes used in chemical industries. -14
mechanical separation methods. -15
Electrostatic and magnetic separation methods. -16
Magnetic separation. -17
Thermal of Separation methods: -18
Chemical Processes Technology. -19
Types of chemical operation processes -20
Catalysts. -21
Methods of preparation of catalysts. -22
Conversion, Efficiency and Yield. -23
Industrial Production 1-Ammonia -24
Industrial Products 2- Nitric Acid. -25
Urea. -26

1. Course Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive Objectives

A1- Study the applications of industrial chemistry and the extent of their future benefit in factories to serve the country.

A2- Identify the devices used in manufacturing and benefit from them in industry

A3- Accustom students to rely on their abilities in the benefit of chemical industries to serve the country.

A4- Teaching students to respect the time allocated to them in electronic classes

A5- Teaching students to take care of devices and their uses inside factories.

B- Course Skill Objectives

B1--. Theoretical applications of industrial chemistry practically in laboratories and the extent of their benefit in manufacturing.

B2- Introducing modern topics related to the curriculum for the academic year.

B3- Teaching students to expand their industrial thinking using modern means of communication from the Internet and benefit from them.

B4- Commitment to professors' instructions, respecting time and teaching students to participate in the electronic class.

Teaching and learning methods

Detailed explanation of industrial topics and providing general information related to industry and increasing production and theoretical explanation with calculations and clarifying them in the electronic class with conducting the quzz, reports and assignments. The lectures were explained in the electronic class with picture and sound.

Evaluation methods

1- Daily exams and weekly assignments.

2- Weekly reports

3- Evaluating students on their behavior and the extent of their respect for time as well as their participation in the electronic class.

C- Emotional and value goals

C1-- Evaluating outstanding students and encouraging them to continue to excel

C2- Participating students in solving their problems

C3- Helping them correct the mistakes they go through as much as possible

Teaching and learning methods

Through lectures in the class and learning to use special measuring devices. As well as explaining industrial topics theoretically in the electronic class and conducting the quzz and weekly assignments and submitting reports on the experiments for the purpose of calculating students' efforts.

Evaluation Methods

1- Weekly Exams

2- Weekly Reports

1- Submitting weekly assignments for the purpose of calculating the effort.

D- General and transferable qualification skills (other skills related to employability and personal development).

D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them.

D2- Developing personal skills by reciting poetry debates through their participation in central celebrations held within the university.

Course structure .3

Evaluation Method	Teaching Method	Unit name/topic	Required learning outcomes	Hours	Week
	Theoretical and Online Teaching	1-Physical processes used in chemical industries. 2-mechanical separation methods. 3-Electrostatic and magnetic separation method 4--agnetic separation. 5-Thermal of Separation methods:	Theoretical and electronic teaching	4 hours	1st, 2nd, 3rd, 4th
Cues with weekly reports and weekly assignments.	Theoretical and Online Teaching	2-Chemical Processes Technology. 7--Types of chemical operation processes 8-Catalysts.	Theoretical and electronic teaching		6th, 7th, 8th, 9th
	Theoretical and electronic teaching Theoretical and electronic teaching	9-Methods of preparation of catalysts. 10-Conversion, Efficiency and Yield. 11-Industrial Production 1-Ammonia	Theoretical and electronic teaching Theoretical and electronic teaching		10th, 11th, 12th
	Theoretical and electronic teaching Theoretical and electronic teaching	12-Industrial Products 2- Nitric Acid. 13-Urea.	Theoretical and electronic teaching Theoretical and		13th, 14th

			electronic teaching		
		Student exam			15th

Infrastructure .4	
Industrial chemistry by Johan k.M. The book of the foundations of industrial chemistry by Professor Muhammad Magdy Wasil Al-Fareed Electronic Library	• Required textbooks
Industrial chemistry book supervised by Prof. Hoda Najm El-Din	• Main references (sources)
Hand book of industrial chemistry. By Mohammad Farhat Ali.	• Recommended books and references (scientific journals, reports, etc.)
All websites related to industrial topics	• Electronic references, Internet sites

1. Curriculum development plan
We have developed scientific topics and introduced new topics to make students understand industries and their benefits to society in ways that keep pace with new scientific developments and develop the foundations of education in electronic classes and participate in them in activities, exams and daily assignments.

Course Description / Biochemistry 1

This course includes coverage of chemical concepts related to the structural and functional classification of carbohydrate and lipid metabolism, the mechanism of their absorption and transport across biological membranes, and a set of experiments designed to teach and train students on the most common methods

University of Baghdad	.1 Educational institution
College of Science / Department of Chemistry	.2 Academic Department/Center
Biochemistry (3) / ChBC 450	3 Course Name/Code
In-person	4 Available Attendance Forms
First Semester / 2023-2022	5 Semester/Year
30 theoretical hours + 45 practical hours	6 Number of Study Hours (Total)
2022/9/1	7 Date of Preparation of this Description

.8 Course Objectives

-1 The objective of teaching biochemistry is to identify metabolic pathways from the perspective of energy calculations.

-2 Linking the metabolic pathways of vital molecules

-3 Studying the harmony and integration in the function of the vital organs of the human body in different nutritional states: in the case of fasting and famine or in the case before and after eating meals.

-4 Studying what happens to energy levels in each nutritional state

-5 Diseases resulting from a malfunction in the function of vital organs

-9 Course outcomes and teaching, learning and evaluation methods

- Cognitive objectives. A-1 Enabling students to gain knowledge and understanding of the intellectual framework of chemistry

A-2 Enabling students to gain knowledge and understanding of international chemical standards A-3 Enabling students to gain knowledge and understanding of the laws of chemistry A-4 Enabling students to gain knowledge and understanding of the standards of chemical analysis

A-5 Enabling students to gain knowledge and understanding of the law of misuse of chemicals

A-6 Enabling students to gain knowledge and understanding of chemistry systems A-7 Enabling students to gain knowledge and understanding of chemistry in English
B - Program specific skill objectives: B1 - Scientific and practical skills B2 - Recall and analysis skills
B3 - Use and development skills
Teaching and learning methods
Providing students with the basics and topics related to knowledge and systems explained in:

1- Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using LCD screens and (show (Data) 2- Providing students with knowledge through homework assignments for the study vocabulary 3- Asking students to visit the library to obtain academic knowledge related to the study vocabulary 4- Improving students' skills by visiting websites to obtain additional knowledge of the study materials 5- Brainstorming during the lecture
Evaluation Methods
Daily tests with multiple-choice questions for academic subjects - Participation grades for difficult competitive questions for students - Setting grades for assigned homework
- Qualitative and quantitative practical tests in laboratories
C- Emotional and value objectives C1 - Enabling students to solve problems related to the intellectual framework of chemistry C2 - Enabling students to solve problems related to international chemistry standards
C3 - Enabling students to solve problems related to the laws of control and quality of chemistry
C4 - Enabling students to solve problems related to chemistry and the English language

Teaching and learning methods
Providing students with the basics and additional topics related to previous educational outcomes for skills to solve scientific problems - Solving a set of practical examples by the academic staff - Participation of students during the lecture to solve some scientific issues
Evaluation Methods - Daily exams with multiple-choice questions that require scientific skills - Daily exams with scientific and practical questions - Participation grades for competitive questions for academic subjects - Setting grades for homework - Assigning students to conduct scientific seminars and discuss them D - General and transferable skills (other skills related to employability and personal development.) D 1 - Enabling students to think and analyze topics related to the intellectual framework and international chemical standards D 2 - Enabling students to think and analyze topics related to company laws and chemical audit standards D 3 - Enabling students to think and analyze topics related to language systems for importing chemicals D 4 - Enabling students to think and analyze topics related to chemistry in English Teaching and learning methods
- Providing students with the basics and additional topics related to the outputs of thinking and chemical analysis - Forming discussion groups during lectures to discuss chemical topics that require thinking and analysis - Asking students a set of thinking questions during lectures such as what, how, when and why for specific topics - Giving students homework that requires self-explanations in causal ways

طرائق التقييم
-امتحانات يومية بأسئلة بيتية حلها ذاتيا - درجات مشاركة لاسئلة منافسة تتعلق بالمادة الدراسية - درجات محددة بواجبات بيتية

10. Course Structure Biochemistry 3 / Theoretical					
Evaluation Method	Teaching Method	Unit Name / Topic	Required learning outcomes	hours	Week
Daily, Weekly, Semester and Final Exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	General introduction to metabolism	-Source of carbon ,Nitrogen&energy -Biological membranes - Transport systems	2	First
Daily, Weekly, Semester and Final Exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Carbohydrate metabolism	-Carbohydrate metabolism a)-Digestion, absorption and transport, b-Glycolysis pathway and energy calculation, c-Citric acid pathway and energy calculation, gluconeogenesis, d-Glycogen metabolism (glycogen synthesis, glycogenolysis), e-Pentose sugar phosphate pathway, f-Cori cycle, g-Metabolism of other sugars (fructose, mannose, galactose)	2	Second
Daily, Weekly, Semester and Final Exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Carbohydrate metabolism	-Carbohydrate metabolism a)-Digestion, absorption and transport, b-Glycolysis pathway and energy calculation, c-Citric acid pathway and energy calculation, gluconeogenesis, d-Glycogen metabolism (glycogen synthesis, glycogenolysis), e-Pentose sugar phosphate pathway, f-Cori cycle, g-Metabolism of	2	Third

			other sugars (fructose, mannose, galactose)		
Daily, weekly, semester and final exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Carbohydrate metabolism	-Carbohydrate metabolism a)-Digestion, absorption and transport, b-Glycolysis pathway and energy calculation, c-Citric acid pathway and energy calculation, gluconeogenesis, d-Glycogen metabolism (glycogen synthesis, glycogenolysis), e-Pentose sugar phosphate pathway, f-Cori cycle, g-Metabolism of other sugars (fructose, mannose, galactose)	2	Fourth
Daily, weekly, semester and final exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Carbohydrate metabolism	-Carbohydrate metabolism a)-Digestion, absorption and transport, b-Glycolysis pathway and energy calculation, c-Citric acid pathway and energy calculation, gluconeogenesis, d-Glycogen metabolism (glycogen synthesis, glycogenolysis), e-Pentose sugar phosphate pathway, f-Cori cycle, g-Metabolism of other sugars (fructose, mannose, galactose)	2	Fifth

Daily, weekly, semester and final exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Carbohydrate metabolism	**Respiratory chain and oxidative phosphorylation**	2	Sixth
		First exam		2	Seventh
Daily, weekly, semester and final exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Lipid metabolism	Digestion absorption and transport of lipid	2	Eighth
Daily, weekly, semester and final exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Lipid metabolism	Fatty acid oxidation -Activation of Fatty Acid -Transport of Acyl-CoA into Mitochondria by Carnitine Transport System -β-oxidation -Energy yield from the β-oxidation of fatty acids	2	Ninth
Daily, weekly, semester and final exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Lipid metabolism	--β-oxidation of a Fatty Acid with an Odd Number of Carbon Atoms -Beta oxidation of unsaturated fatty acids -Alpha-oxidation	2	Tenth
Daily, weekly, semester and final exams	-1 Paper lectures -2 Electronic screen -3 Video lectures via electronic classes	Lipid metabolism	Metabolism of keton bodies Ketogenesis Utilization of Ketone Bodies Ketoacidosis	2	Eleventh

Daily, weekly, semester and final exams	1 Paper lectures - 2 Electronic screen - 3 Video lectures via electronic classes	Lipid metabolism	-DE NOVO synthesis of fatty acids)Lipogenesis -Synthesis of lomg chain fatty acids	2	Twelfth
Daily, weekly, semester and final exams	1 Paper lectures - 2 Electronic screen - 3 Video lectures via electronic classes	Lipid metabolism	Triacyl glycerol metabolism Synthesis of - Triacylglycerol in Adipose Tissue Degradation of - Triacylglycerols in Adipose Tissue -Lipoprotein metabolism	2	Thirteenth
Daily, weekly, semester and final exams	1 Paper lectures - 2 Electronic screen - 3 Video lectures via electronic classes	Lipid metabolism	Cholesterol metabolism -De Novo Synthesis of Cholesterol -Degradation of Cholesterol	2	Fourteenth
		Midterm exam		2	Fifteenth

Course Structure Biochemistry 3 / Practical					
Evaluation method	Teaching method	Name of unit/course or topic	Learning Outcomes Required	hours	week
Weekly Exams and Reports	-1 Paper lectures -2	Collection and handling of blood and urine samples.	Learn how to collect blood and urine samples and how to handle them	3	1

	Electron ic screen				

Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	Blood glucose	Blood sugar concentration estimation	**3**	2
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	Renal function test: -Blood urea.	Study of kidney function tests	3	3
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	-Blood uric acid.	Serum urea estimation	3	4
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	-Plasma creatine and creatinine	Uric acid estimation	3	5
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	Lipid profile Serum cholesterol (Total).	Creatine and creatinine in serum and blood plasma	3	6
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	Scheme for salt fraction of serum proteins: -Total proteins.	Serum total lipid estimation	3	7
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	-(Albumin + α-globulin). -Albumin. -γ-globulin.	Serum total protein estimation	3	8
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	Liver function test in blood: -Serum bilirubin.	Serum albumin and globulin estimation	3	9

Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic	-Serum phosphatases.	Blood	3	10
Weekly Exams and Reports	--1 Paper lectures -2 Screen Electronic n	-Serum transaminases.	Study of liver function tests	3	11

	--1 Paper lectures				
Weekly Exams and Reports	-2 Screen	Minerals: -Serum calcium. -Serum phosphates	Calcium and phosphate determination in serum	3	12
Weekly Exams and Reports	---1 Paper lectures -2 Screen Electronic n	Pancreatic test: Serum α-Amylase.	Alpha amylase determination in serum	3	13
Weekly Exams and Reports	---1 Paper lectures -2 Screen Electron ic n	Qualitative test of various constituents of saliva.	Quantitative determination of different saliva components	3	14
		exam		3	15

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Cample biology, 9th edition 2009. Jane B. Reece, Lisa A Urry, Micheal L. Cain.	-1 Required textbooks
Biochemistry, 3th edition 2008. Mathews, Van Holde, Ahern	-2 Main references (sources)
Lehninger Principles of Biochemistry, Fourth Edition 2010.	A- Recommended books and references (scientific journals, reports,
Many sites that deal with biochemistry, including medical sites.	B- Electronic references and websites.

. 12. Curriculum development plan
Updating scientific material using

Course Description Form

For the Third Stage

Second Semester

2022-2023

Course Description / Physical Chemistry 4

This course description provides a study of the basic laws of electrochemistry/electrical conduction in solutions/Debye-Haeckel theory/electrochemical cells, electrode potentials, concentration cells and batteries.	
University of Baghdad / College of Science	1. Educational Institution
Chemistry Department	2. University Department/Center
Physical Chemistry 4 /Electrical 343 ChPC/	3. Course Name/Code
Weekly in-person	4. Available Attendance Forms
2023-2022	5. Semester/Year
30 hours = 15 x hours2	6. Number of Study Hours (Total)
1-9-2022	7. Date this Description was Prepared
1. Course Objectives	
The student will learn the basic concepts of electrochemistry	
Study the basic laws of electrochemistry / electrical conduction in solutions / Debye-Haeckel theory / electrochemical cells, electrode potentials, concentration cells and batteries	

1. Course Outcomes and Teaching, Learning and Evaluation Methods
A- Cognitive Objectives
A1- The possibility of inferring the basics of electrochemical cells and electrochemical conduction A2- Electrolysis A3- Electrolytic conduction of solutions A4- Debye theory, structure and thickness of the ionic atmosphere/ Kolarach's law/transfer numbers and absolute velocity of ions A5- Electrochemical cells/ electrode potentials/ electrochemical series A6- Concentration cells and batteries B- Course specific skill objectives B1-. Application on electrochemical cells and electrochemical conduction B2 - Application - Electrolysis and electrolytic conduction of solutions B3 - Debye theory Structure and thickness of the ionic atmosphere/Colarach's law/Transition numbers and absolute velocity of ions B4- Electrochemical cells/Electrode potentials/Electrochemical series
Teaching and learning methods
1- Using the board
2- Using the display screen
Evaluation methods
1- Written tests
2- Asking questions during the lecture
3- Daily exams
4- Homework
C- Emotional and value-based objectives
C1- The student understands the university behavior that must be demonstrated
C2- Cultivating a spirit of cooperation among students, such that the learner provides assistance to his friends in the classroom or does group work in the classroom C3- Developing some interests and hobbies among students Teaching and learning methods E-learning Evaluation methods 1- Student response during the lecture

2- Student behavior and commitment to the lecture system.
3- Daily and semester exams.
4- Homework
D- General and transferable qualification skills (other skills related to employability and personal development).
D1- Assigning students to follow up on published research and articles in international journals.
D2- Encourage them to attend postgraduate theses discussions and seminars.
D3- Urge them to borrow scientific books from the university library to view and study the latest publications.
D4- Discuss modern scientific research with them.

Course structure .1

Evaluation Method	Teaching Method	Unit Name / Topic	Required Learning Outcomes	hours	Week
Semester and Daily Exams	Paper and electronic lectures	Electrophysical Chemistry	Introduction to Electrophysical Chemistry / Ohm's Law / Conductors, Semiconductors and Insulators + Application Examples	2	1
Semester and Daily Exams	Paper and electronic lectures	=	Faraday's Laws with Application Examples	2	2
Semester and Daily Exams	Paper and electronic lectures	=	Electrolytic Conductivity / Conductivity, Specific Conductivity and Cell Constant + Application Examples	2	3
Semester and Daily Exams	Paper and electronic lectures	=	Wusten's Bridge and Factors Affecting Electrolytic Conductivity in Solutions + Application Examples	2	4
Semester and Daily Exams	Paper and electronic lectures	=	Equivalent Conductivity and Molar Conductivity + Units with Application Examples	2	5
Semester and Daily Exams	Paper and electronic lectures	=	Colarach's Law and Independent Migration of Ions with its Applications	2	6
Semester and Daily Exams	Paper and electronic lectures	=	Finding/Specific Conductivity for Weak Electrolytes/Ionization Degree of Water/Solubilization Product Constant for Sparingly Soluble Salts with Application Examples	2	7
Midterm and Daily Exams	Paper and electronic lectures	=	Transition Numbers with Application Examples	2	8
Midterm and Daily Exams	Paper and electronic lectures	=	Absolute velocity of ions with applied examples	2	9

Midterm and Daily Exams	Paper and electronic lectures	=	Debye-Haeckel theory / activity and activity coefficients and ionic strength, finding the activity coefficient / thickness of the ionic atmosphere / Debye-Haeckel-Onsaker equation with applied examples	2	10
Midterm and Daily Exams	Paper and electronic lectures	=	Electrochemical cells / Galvanic cells and electrolytic cells	2	11
Midterm and Daily Exams	Paper and electronic lectures	=	Electrode potential indication / Salt bridge / Cell design with applied examples	2	12
Midterm and Daily Exams	Paper and electronic lectures	=	Nernst equation with application examples Reversible and irreversible cells Thermodynamic values of electrochemical cells	2	13
Midterm and Daily Exams	Paper and electronic lectures	=	Types of electrodes and standard electrodes with practical examples	2	14
Midterm and Daily Exams	Paper and electronic lectures	=	Concentration cells with practical examples	2	15

Infrastructure .2	
Essential of Physical Chemistry Fundamental of Physical Chemistry	1- Required textbooks
Essential of Physical Chemistry Fundamental of Physical Chemistry	2- Main references (sources)
Fundamental of Physical chemistry	A- Recommended books and references
Sites related to physical chemistry	(scientific journals, reports,.....)

1. Curriculum development plan
The increasing use of information technology or Internet references, and changes in content as a result of keeping pace with the great development in the world of technology and information.

Course Description / Physical Chemistry (Practical) - 2 -

This course description provides laboratory applications of physical chemistry and the extent to which students benefit from the practical aspect and its application in the theoretical lesson and its application in practical life after graduation. New experiments have been introduced to keep pace with scientific development.

1. Educational institution	University of Baghdad
2. Academic department/center	College of Science / Department of Chemistry
3. Course name/code	/ Physical Chemistry Laboratory 2/ 344 ChPpC
4. Available forms of attendance	Weekly in-person
5. Semester/year	First semester 2023-2022
6. Number of study hours (total)	60 hours = 15 x 4 hours
7. Date this description was prepared	1-9-2022

1. Course objectives

Laboratory applications of physical chemistry and the extent to which students benefit from the practical aspect and apply it in the theoretical lesson and apply it in practical life after graduation. New experiments have been introduced that keep pace with scientific development. All students participate in the electronic class and conduct daily exams (and cups) and submit reports on experiments on a weekly basis.

1- Studying the kinetics of the hydrolysis of methyl acetate catalyzed by hydrochloric acid

2-1-Determination of the dissociation constant for weak acid by conductivity measurements

2- Determination of standard electrode potential for zinc and copper.

The hydrolysis of ethyl acetate by sodium hydroxide (equal conc.) (Second-order reaction)

Determination of the decomposition potential for some electrolytes

Determination of the solubility of sparingly soluble salt

Anodizing Aluminum (Honeycomb Nonporous Al2O3)

1. Course Outcomes and Teaching, Learning and Evaluation Methods
A- Cognitive Objectives A1- A1- Study the practical applications of physical chemistry and the extent of their future benefit A2- Identify laboratory measuring devices and benefit from them in industry A3- Accustom students to rely on their abilities in performing practical experiments. A4- Teaching students to respect the time allocated to them in laboratory work A5- Teaching students to take care of laboratory devices and tools in order to continue work A6- Teaching students how to deal with chemicals and general safety in the laboratory.
B - Course specific skill objectives B1 -—. Theoretical physical chemistry applications in the laboratory and the extent of benefit from them B2 - Introducing modern experiments related to the curriculum for the academic year B3 - Teaching students to derive information from modern means of communication from the Internet and benefit from them B4 - Commitment to laboratory instructions and holding accountable those who violate them. Teaching students to participate in the class .
Teaching and learning methods: Providing general information related to physical experiments and how to prepare solutions with specific concentrations and weights according to the physical laws for this purpose. Theoretical explanation with calculations and their clarification in the electronic class with the implementation of tests, reports and assignments.
Evaluation methods
1- Daily exams and weekly assignments electronically. 2- Weekly reports electronically 3- Evaluating students on their attendance and participation in the electronic class.
C- Emotional and value-based objectives C1-- Evaluating outstanding students and encouraging them to continue to excel C2- Involving students in solving their problems C3- Helping them correct the mistakes they are going through as much as possible
Teaching and learning methods
hrough the electronic class, explaining how to prepare standard solutions and learning how to use special measuring devices. As well as explaining the experiments theoretically in the electronic class with a video lecture, conducting the weekly beakers and assignments electronically, and submitting reports on the experiments electronically for the purpose of calculating the students' efforts.
Evaluation methods
• Weekly electronic exams Weekly electronic reports • Submitting weekly assignments for the purpose of calculating effort in the electronic class.
D - General and transferable skills (other skills related to employability and personal development)

D1 - Enable students to think and analyze topics related to the intellectual framework and international chemical standards
D2 - Enable students to think and analyze topics related to company laws and chemical audit standards
D3 - Enable students to think and analyze topics related to language systems for importing chemicals
D4 - Enable students to think and analyze topics related to chemistry in English

Course structure .1

Evaluation method	Required learning outcomes	Unit name/topic	Teaching method		hours or week
In the lab in the first weeks	Inside the lab	An introductory lecture about the laboratory and a simplified explanation of the experiments and the most important vocabulary that the student must know in the الفيزياوية laboratory	Inside the lab	4	1-2
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Studying the kinetics of the hydrolysis of methyl acetate catalyzed by hydrochloric acid.	My Lab Work	4	3
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Experiment (2A) 1-Determination of the dissociation constant for weak acid by conductivity measurements. Experiment 2 B 2- Determination of standard electrode	My Lab Work	4	4

		potential for zinc and copper.			
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	The hydrolysis of ethyl acetate by sodium hydroxide (equal conc.) (Second-order reaction)	My Lab Work	4	5
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	The hydrolysis of ethyl acetate by sodium hydroxide (equal conc.) (Second-order reaction)	My Lab Work	4	6
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Determination the effect of acid concentration on the rate of inversion of sucrose	My Lab Work	4	7
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Determination of the decomposition potential for some electrolytes.	My Lab Work	4	8
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Salt effect on the reaction rate	My Lab Work	4	9
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Determination of activity coefficient from solubility of weak electrolyte	My Lab Work	4	10
Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Anodizing Aluminum (Honeycomb Nonporous Al2O3)	My Lab Work	4	11

Daily cup, weekly reports, and evaluation of work and behavior in the laboratory	Inside the lab	Synthesis and characterization of nano dye sensitive solar cell (DSSC) cell	My Lab Work	4	12
			My Weekly Make-up		13
			Final Exam		14
			Final Exam		15

1. Infrastructure	
Experiments inphysical chemistry by JAMIS.	• Required textbooks
Practical physical chemistry book supervised by Asst. Hoda Najm El-Din and M. Haifa Abdul Amir	• Main references (sources)
Basics of physical chemistry and its practical applications by Dr. Khaled Issa Al-Ani (1980)	• Recommended books and references (scientific journals, reports, etc.)
Experiments inphysical chemistry,David P.Shoemaker,Carl W.Garland,Jeffrey I.Steinfeld. Developing the foundations of education in electronic classes and participating in activities.	• Electronic references, ● websites

1. Curriculum Development Plan
My supervisors and teaching staff in the laboratory have developed scientific experiments and introduced new experiments to work in the laboratory that keep pace with new scientific developments, experiments in nanotechnology and solar energy cells. And developing the foundations of education in electronic classes and participating in them in activities, exams and daily assignments.

Course Description / Industrial Chemistry 2

	This course description provides applications in chemistry and study of theoretical industrial chemistry and industrial applications of chemistry and laboratories and the extent to which students benefit from the practical aspect and apply it in practical life after graduation. New industrial topics have been introduced to keep pace with scientific development.
University of Baghdad D	1. Educational institution

College of Science / Department of Chemistry	2. Academic department/center
Industrial Chemistry-2 / for the third stage 346 ChIN	3. Course name/code
	4. Available forms of attendance
Weekly in-person	5. Semester/year
Second semester / 2023-2022	6. Number of study hours (total)
1/9/2022	7. Date this description was prepared

1. Course objectives

Applications in chemistry and study of theoretical industrial chemistry and industrial applications of chemistry and laboratories and the extent to which students benefit from the practical aspect and apply it in practical life after graduation. New industrial topics have been introduced to keep pace with scientific development. Participation in the electronic class for all students and conducting exams, assignments and quizzes and creating industrial reports contribute to calculating effort and interaction in the electronic class. These are among the topics that were studied in the second course.

Fuel and Energy(1-Coal2-coal gasification3-Natural gas4-petroleum) -1

Processes in the oil refinery[Physical process, Thermal process, catalytic process]. -2

Corrosion -3

Theories of Corrosion -4

Water treatment for Industrial processes -5

-Water hardness -6

-Water testing -7

14-Removal of water hardness. -8

Pollution -9

10-Forms of Pollution

11-Industral Pollution

12-Effects of water Pollution

13-Industrial Production of Sulfuric acid.

14-Manufacturing of Ammonium Nitrate

1. Course Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive Objectives

1A- Study the applications of industrial chemistry and the extent of their future benefit in factories to serve the country.

A2- Identify the devices used in manufacturing and benefit from them in industry

A3- Accustom students to rely on their abilities in the benefit of chemical industries to serve the country.

A4- Teaching students to respect the time allocated to them in electronic classes

A5- Teaching students to take care of devices and their uses inside factories.

B- Course Skill Objectives

B1 –. Theoretical industrial chemistry applications practically in laboratories and the extent of their benefit in manufacturing.

B2- Introducing modern topics related to the curriculum for the academic year.

B3- Teaching students to expand their industrial thinking using modern means of communication from the Internet and benefit from them.

B4- Commitment to professors' instructions, respecting time and teaching students to participate in the electronic class.
Teaching and learning methods
Detailed explanation of industrial topics and providing general information related to industry and increasing production and theoretical explanation with calculations and clarifying them in the electronic class with conducting exams, reports and assignments. The lectures were explained in the electronic class with pictures, sound and video lectures.
Evaluation methods Daily exams and weekly assignments. 2- Weekly reports 3- Evaluating students on their behavior and the extent of their respect for time as well as their participation in the electronic class and submitting quarterly reports. C- Emotional and value goals C1-- Evaluating outstanding students and encouraging them to continue to excel C2- Participating students in solving their problems C3- Helping them correct the mistakes they go through as much as possible Evaluation methods
- Weekly exams • Weekly reports • Submitting weekly assignments for the purpose of calculating the effort. • Participating in activities and submitting quarterly reports. D - General and transferable skills (other skills related to employability and personal development). D 1 - Enable students to think and analyze topics related to the intellectual framework and international chemical standards D 2 - Enable students to think and analyze topics related to company laws and chemical audit standards D 3 - Enable students to think and analyze topics related to language systems for importing chemicals D 4 - Enable students to think and analyze topics related to chemistry in English

Course structure .1

Evaluation method	Teaching method	Unit name/topic	Required Learning Outcomes	hours	Week
	Theoretical e-learning	1-Fuel and Energy(1-Coal2-coal gasification3-Natural gas4-petroleum)	Theoretical E-learning	4	1

		-2-Processes in the oil refinery[Physical process, Thermal process, catalytic process]. 3-Corrosion 4-Theories of Corrosion			
Courses with weekly reports and weekly assignments. Monthly exams and quarterly reports and their evaluation.	Theoretical e-learning	5-Water treatment for Industrial processes 6-Water hardness 7-Water testing 8-Removal of water hardness. 9--Pollution 10-Forms of Pollution	Theoretical E-learning		2
	Theoretical e-learning	11-Industral Pollution 12-Effects of water Pollution	Theoretical E-learning		3
	Theoretical e-learning	13--Industrial Production of Sulfuric acid. 14-Manufacturing of Ammonium Nitrate	Theoretical E-learning		4
		Student exam			5

1. Infrastructure	
Industrial Chemistry Basics Book by Professor Mohamed Magdy Wasil	• Required textbooks
Al-Fareed Electronic Library	• Main references (sources)

Industrial Chemistry Handbook Supervised by Prof. Hoda Najm El-Din	• Recommended books and references (scientific journals, reports, etc.)
Hand book of industrial chemistry. By Mohammad Farhat Ali.	• Electronic references, websites

1. Curriculum development plan
We have developed scientific topics and introduced new topics to make students understand industries and their benefits to society in ways that keep pace with new scientific developments and develop the foundations of education in electronic classes and participate in them in activities, exams and daily assignments.

Course Description / Radiochemistry

This course description provides specialists who are familiar with the basics of chemistry, both theoretically and practically, and who are able to meet the needs of the labor market in addition to teaching chemistry to students of other departments in the College of Science.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Radio Chemistry 347 ChRC	3. Course name/code
Weekly in-person	4. Available forms of attendance
Second 2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
1-9-2022	7. Date this description was prepared

1. Course Objectives

Preparing specialists who are familiar with the basics of chemistry theoretically and practically, capable of meeting the needs of the labor market, in addition to Teaching chemistry to students of other departments in the College of Science.

Conducting scientific research and trying to keep pace with the scientific development of chemistry.

Cooperating with state institutions and the private sector by providing scientific advice and consultation and conducting chemical analyses.

Course outcomes, teaching, learning and assessment methods A-Cognitive objectives. A1-Enabling students to gain knowledge and understanding of the intellectual framework of radio

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gain know ledge and under standi ng of radio active conta minat ion stand ards A5- Enabl ing stude nts to gain know ledge and under standi ng of the law of misus e of radio active sourc es B- Cours e specif ic skill

objectives
B1- Scientific and practical skills
B2- Recall and analysis skills
B3- Use and development skills
Teaching and learning methods
Providing students with the basics and topics related to knowledge

and systems explained in: 1- Clarifying and explaining the study materials by the academic staff through the white board and using PowerPoint using LCD and Data show screens 2- Providing stude

nts with knowledge through homework assignments for the study vocabulary 3- Asking students to visit the library to obtain academic knowledge related to the study vocabulary 4- Improving students' skills

through Visit websites to gain additional knowledge about the study materials 5- E - LEARNING and google classroom
Evaluation Methods Daily tests with m

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alframeworkandstandardsofradiochemistry D2-Enabling students to think and analyze

topics related to company laws and standards for dealing with radioactive materials

Course structure .1

Evaluation Method	Teaching Method	Unit name/topic	Required learning outcomes	hours	week

Semester and Daily Exams	Paper and Cardboard Lectures	Radio chemistry	Introduction of Radio chemistry	4	1-2
Semester and Daily Exams	Paper and Cardboard Lectures	Radio chemistry	Regions of the electromagnetic	4	3-4
Semester and Daily Exams	Paper and Cardboard Lectures	Radio chemistry	Types of ionizing radiation	4	5-6
Semester and Daily Exams	Paper and Cardboard Lectures	Radio chemistry	The extent of penetration of ionizing rays	4	7-8
Semester and Daily Exams	Paper and Cardboard Lectures	Radio chemistry	The types of influence for a gamma ray calculated mathematically	4	9-10
Semester and Daily Exams	Paper and Cardboard Lectures	Radio chemistry	Types of subatomic particles	4	11-12
Semester and Daily Exams	Paper and Cardboard Lectures	Radio chemistry	Nuclear reactors	4	13-14

1. Infrastructure	
Essential of Physical Chemistry	• Required textbooks
Radiochemistry Dr. Majeed Al-Qaisi	• Main references (sources)
Essential of Physical Chemistry	• Recommended books and references (scientific journals, reports, etc.)
Radiochemistry Dr. Majeed Al-Qaisi	• Electronic references, websites

1. Curriculum development plan
According to the requirements of the Ministry of Higher Education and Scientific Research, so that it is consistent with the latest local scientific trends and global scientific requirements.

Course Description / Inorganic Chemistry 6

This course description provides basic theoretical models and their properties, and the techniques needed to prove those theories in practical or more advanced experimental terms. Students will be able to stand up to interpret and find solutions to the requirements.

University of Baghdad - College of Science	1. Educational institution
Chemical Sciences	2. Academic department/center
Coordination Chemistry/Inorganic-6-341 ChIC	3. Course name/code
In-person	4. Available forms of attendance
Second/2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
1/9/2022	7. Date this description was prepared

Course Objectives

The theoretical foundations of inorganic chemistry have expanded significantly in recent years. The aim of this course is to study the basic theories and foundations on which inorganic chemistry is built.

The course introduces basic theoretical models and their properties, and the techniques needed to prove those theories in practical or more advanced experimental terms. Students will be able to stand on the interpretation and find solutions to the requirements. It is expected that students will become from the theoretical expertise that supports and enhances the practical side in the main topics, and have the opportunity to explore the real-world topics in this field.

1. Course Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive Objectives

A1- Clarifying the basic concepts and theories on which inorganic chemistry was built or founded through a group.

A2- Acquiring skills in dealing with the problem.

A3- Acquiring basic skills as an introduction to building.
A4- Acquiring theoretical concepts for dealing with data and employing them in pre-prepared software to obtain information sufficient to reach knowledge of the compounds to be prepared according to scientific foundations.
B- Course specific skill objectives
B1- The ability to think about dealing with the problem according to specific rules by using the creative and deductive method or method and avoiding the rote and rote method.
B2- Writing scientific reports.
B3- Knowing the link between the theoretical course and the practical course.

Teaching and learning methods

Adopt blended learning (direct learning through the use of the board and display screen and e-learning using multiple programs that ensure fruitful communication between the teacher and the student).

Evaluation methods

- Readings, self-learning, discussion groups.

- Training and activities in the classroom.

- Guiding students to some websites to benefit from them to develop capabilities.

- Holding research sessions through which some problems are explained and analyzed and the mechanism for finding solutions to them.

- Conducting written tests and oral dialogues in almost every lecture.

- In addition to monthly exams and final exams.

C- Emotional and value objectives
C1- - Ensuring that the student understands the prescribed materials and desires to learn them through interaction with the teacher and the material

Teaching and learning methods

Using teaching methods that create mental and creative thinking in students, transcending the traditional method (memorization and indoctrination).
Evaluation Methods
- Assigning students to review what is published about the semester topic through the Internet.

- Urging students to borrow scientific sources from the department or college library to review the study topic.
- Opening horizons for the student to think about investing the prepared compounds in many fields that serve the community

D- General and transferable qualification skills (other skills related to employability and personal development).

D1 - Enabling students to think and analyze topics related to the intellectual framework and international chemical standards

D2 - Enabling students to think and analyze topics related to company laws and chemical auditing standards

D3 - Enabling students to think and analyze topics related to language systems for importing chemicals

D4 - Enabling students to think and analyze topics related to chemistry in English

Course structure .1

Evaluation Method	Teaching Method	Unit name/topic	Required learning outcomes	hours	Week
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Crystal Field Theory (CFT), the hybridization of atomic orbitals, high & low spin complexes, crystal field stabilization energy (CFSE), comparison between VBT & CFT		2	1
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Cont.		2	2
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Cont.		2	3
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Cont.		2	4
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Molecular Orbital Theory (MOT), methods of preparation of coordination complexes		2	5
Monthly Exam, Daily Exam and Discussion	Using Blended Learning	Cont.		2	6

within the Lecture					
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Oxidation- reduction reaction, mechanism of ligand substitution (SN1, SN2)		2	7
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Cont.		2	8
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Homogeneous & heterogeneous catalysts		2	9
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Preparation of cis & trans complexes		2	10
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Stabilization of complexes		2	11
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Kinetic and thermodynamic stability, calculation of stability constants and factors effecting it. active & inert complexes		2	12
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Cont.		2	13
Monthly Exam, Daily Exam and Discussion within the Lecture	Using Blended Learning	Cont.		2	14

	1. Infrastructure
Theoretical coordination chemistry book - the curriculum	• Required textbooks
Theoretical coordination chemistry books - internationally approved	• Main references (sources)
1. Inorganic Chemistry, J. E. Huheey, E. A. Keiter, R. L. Keiter,(4th edn.), 1993	
2. Basic Inorganic Chemistry, E. A. Cotton, G. Wilkinson, (3rd edn.) 1995, Wiley interns Edition	• Recommended books and references (scientific journals, reports, etc.)
Scientific journals, periodicals and research in the specialty	• Electronic references, websites.

1. Curriculum development plan
- Developing the curriculum content by deleting, adding and replacing according to administrative procedures. - Using modern teaching methods according to the nature of the subject and the level of learners from time to time.

- Using modern assessment tools that the student interacts with and at the same time keeps him away from the atmosphere of boredom and repetition. - Field visits to some scientific research institutions related to the subject of the curriculum to consolidate what is learned in the semester and to stand on the methods directly in person.

Course Description / Organic Chemistry 4

This course description provides students with the basics and concepts of organic chemistry for some of the chapters allocated to the third stage, completing what was explained in the basics of the first course, where topics related to amines and phenols, their important reactions, and the mechanism of these reactions were explained, as well as explaining the best unsaturated carbonyl compounds, polyaromatic compounds, and heterocyclic compounds.	
[University of Baghdad - College of Science - Department of Chemistry	1. Educational institution
Department of Chemistry	2. Academic department/center
Organic Chemistry 4- 342 ChOC	3. Course name/code
In-person	4. Available forms of attendance
2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
1-9-2022	7. Date this description was prepared

.1 Course objectives: Teaching students the basics and concepts of organic chemistry for some chapters allocated to the third stage, completing what was explained in the basics of the first course, where topics related to amines and phenols and their important reactions and the mechanism of these reactions were explained, as well as explaining the best unsaturated carbonyl compounds, polyaromatic compounds and heterocyclic compounds. Opening new horizons by presenting some concepts in new ways and innovative ways by making students interact with them to increase their knowledge of the curriculum and assistance books. With the presence of video lectures, the student lives in a traditional lecture environment with the same discussion methods by asking questions and the professor answering, ensuring the integration of the foundations of a successful lecture.

2. Course Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive Objectives

A1- Gain a good understanding of the academic content of the subject of organic hemistry

A2- Prepare the student to comprehend and prepare for the topics in the subsequent stages

A3- Educate and train the student to solve the exercises by following a special mechanism

A4- Instill confidence in the students and encourage them to engage in useful dialogue and discussion.

A5- Allow students to suggest new methods and ideas that help them understand ifficult topics

A6- Help students to conduct short exams outside the time allocated for the lecture

B- Course Skill Objectives

B1- The ability to find solutions and derive ideas for various issues and mechanics

B2- Encourage students to read and follow up by conducting electronic and video meetings

B3- Help students use important electronic programs that facilitate their nderstanding of the subject

B4- Also help them in terms of teaching them some electronic programs that facilitate the process of conducting electronic exams

Teaching and learning methods

Modern methods were used in education, including video and audio lectures SCREEN RECORDER, attaching audio and video files to the Google Classroom program, and using electronic programs to meet students directly, such as Google Meet, ZOOM, FCC, WEBAX, and others, to facilitate the task of teaching students and their understanding of the material.

Evaluation Methods

Short exams were conducted and homework assignments were given, as well as monthly exams with a pre-set date, as well as writing reports on organic chemistry and the topics that were given

C- Emotional and value-based objectives

C1- The student understands the university behavior that must be demonstrated

C2- Cultivating a spirit of cooperation among students, such as the learner providing assistance to his friends in the classroom or doing group work in the classroom

C3- Developing some interests and hobbies among students

C4- Sensing the harms of smoking and drugs on health and society

Teaching and learning methods

Modern methods were used in education, including video and audio lectures SCREEN RECORDER and attaching audio and video files to the Google Classroom program and using electronic programs to meet students directly such as Google Meet, ZOOM, FCC, WEBAX, and others to facilitate the task of teaching students and their understanding of the material.
Evaluation Methods

Short exams were conducted and homework assignments were given, as well as monthly exams with a pre-set date, as well as writing reports on organic chemistry and the topics that were given

D - General and transferable qualification skills (other skills related to employability and personal development).

D1-- Working on developing a distinguished personality for the student by developing cultural and social awareness, which qualifies him after graduation to serve the community

D2-- Working on creating a suitable scientific environment for preparing highly specialized cadres while developing their scientific and practical capabilities

D3- Communicating with graduate students to know the lessons they benefited from in their field of work to work on developing the vocabulary of these lessons

D4- Using the sources and terms specific to the course

Course structure .2

Evaluation Method	Teaching Method	Unit Name / Topic	Required learning outcomes	hours	Week
Quizzes, monthly exams and oral discussions	Electronic - Visual Video Lectures	Organic Chemistry 4	Amines I and II	8	1-2-3-4
Quizzes, monthly exams and oral discussions	Electronic - Visual Video Lectures	Organic Chemistry 4	phenols	4	5-6
			Monthly exam	2	7
Quizzes, monthly exams and oral discussions	Electronic - Visual Video Lectures	Organic Chemistry 4	Alpha , beta – unsaturated ket	2	8-9
Quizzes, monthly exams and oral discussions	Electronic - Visual Video Lectures	Organic Chemistry 4	Aryl halides	2	10
Quizzes, monthly exams and oral discussions	Electronic - Visual Video Lectures	Organic Chemistry 4	Poly nuclear aromatic system	4	11-12
Quizzes, monthly exams and oral discussions	Electronic - Visual Video Lectures	Organic Chemistry 4	Heterocyclic compounds	4	13-14
			Monthly exam	2	15

1. Infrastructure	
Morrison and Boyd book, 6th edition	• Required textbooks
Muccmurry book	• Main references (sources)
-Principles of organic chemistry, Salmon	• Recommended books and references (scientific journals, reports, etc.)

-Organic letters, UK reports	
https://ar.wikipedia.org/wiki/%D9%83%D9%8A%D9%85%D9%8A%D8%A7%D8	• Electronic references, websites

1. Curriculum development plan
- Adding illustrative tools, especially when explaining the stereochemistry of organic compounds that contain asymmetric carbon atoms

Course Description / Biochemistry 2

This course covers chemical concepts related to the structural and functional classification of proteins, an introduction to enzymes, vitamins, metabolism, and a set of experiments designed to teach and train students on the most common methods and devices used in biochemistry.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Biochemistry (2) / 345 ChBC	3. Course name/code
In-person	4. Available forms of attendance
Semester 2 / 2023-2022	5. Semester/year
30 theoretical hours + 45 practical hours	6. Number of study hours (total)
1/9/2022	7. Date this description was prepared

1. Course Objectives

1- Introducing the student to the basics of general biochemistry

2- Introducing the student to the importance of biochemistry for living organisms in general and humans in particular

3- Teaching the student how to detect biological molecules practically

2. Course Outcomes and Teaching, Learning and Evaluation Methods

- Cognitive Objectives.

A1- Enabling students to gain knowledge and understanding of the intellectual framework of chemistry

A2- Enabling students to gain knowledge and understanding of international chemical standards

A3- Enabling students to gain knowledge and understanding of the laws of chemistry

A4- Enabling students to gain knowledge and understanding of the standards of chemical analysis

A5- Enabling students to gain knowledge and understanding of the law of misuse of chemicals

A6- Enabling students to gain knowledge and understanding of chemistry systems

A7- Enabling students to gain knowledge and understanding of chemistry in English

B- Program specific skill objectives:

B1- Scientific and practical skills
B2- Recall and analysis skills
B3- Use and development skills
Teaching and learning methods
Providing students with the basics and topics related to knowledge and systems explained in:
1- Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using LCD and Data show screens
2- Providing students with knowledge through homework For academic vocabulary
3- Asking students to visit the library to gain academic knowledge related to academic vocabulary
4- Improving students' skills by visiting websites to gain additional knowledge of academic subjects
5- Brainstorming during the lecture

Evaluation methods

Daily tests with multiple-choice questions for academic subjects
- Participation grades for difficult competitive questions for students
- Setting grades for assigned homework
- Qualitative and quantitative practical tests in laboratories
C- Emotional and value-based objectives
C 1 - Enabling students to solve problems related to the intellectual framework of chemistry
C 2 - Enabling students to solve problems related to international chemistry standards
C 3 - Enabling students to solve problems related to the laws of control and quality of chemistry
C 4 - Enabling students to solve problems related to chemistry and the English language
Teaching and learning methods
Providing students with the basics and additional topics related to previous educational outcomes for problem-solving skills
Scientific
- Solving a set of practical examples by the academic staff
- Student participation during the lecture to solve some scientific issues
Evaluation methods
- Daily exams with multiple-choice questions that require scientific skills
- Daily exams with scientific and practical questions
- Participation grades for competitive questions for academic subjects
- Setting grades for assignments Homework
- Assigning students to do scientific seminars and discuss them

D- General and transferable skills (other skills related to employability and personal development). D1 - Enabling students to think and analyze topics related to the intellectual framework and international chemical standards D2 - Enabling students to think and analyze topics related to company laws and chemical auditing standards D3 - Enabling students to think and analyze topics related to language systems for importing chemicals D4 - Enabling students to think and analyze topics related to chemistry in English
Teaching and learning methods - Providing students with the basics and additional topics related to the outputs of thinking and chemical analysis - Forming discussion groups during lectures to discuss chemical topics that require thinking and analysis - Asking students a set of thinking questions during lectures such as what, how, when and why for specific topics - Giving students homework that requires self-explanations in causal ways
Evaluation Methods
- Daily exams with self-solved homework questions

10. Course structure Biochemistry 2 / Theoretical					
Evaluation Method	Teaching Method	Unit Name / Topic	Required learning outcomes	hours	Week
Daily, Weekly, Semester and Final Exams	Teaching Method 1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Proteins	Structure of protein Primary Structure of Proteins Secondary Structure of Proteins α-Helix β-Pleated Sheet	2	First
Daily, Weekly, Semester and Final Exams	Teaching Method 1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Proteins	Tertiary Structure -Tertiary Structure Stabilizing Forces Quaternary Structure of Protein -Quaternary Structure Stabilizing Forces Bonds Responsible for Protein Structure	2	Second
Daily, Weekly, Semester and Final Exams	Teaching Method 1-Paper lectures 2-Electronic screen	Proteins	Properties of protein Osmotic Pressure	2	Third

	3-Video lectures via electronic classes		Molecular Weight Solubility Amphoteric Nature and Isoelectric pH of the Proteins Precipitation of Proteins Denaturation of protein		
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Enzymes	-Definition of enzyme -Zymogen or proenzyme -Cofactors (Coenzyme and activator) -Energy Changes Occur During the Reaction -Mechanism of enzyme action Lock and Key Model- Induced Fit Model-	2	Fourth
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Enzymes	-Enzyme classification Specificity of enzyme action -Factors affecting the velocity of enzyme reaction -Enzyme kinetics Michaelis-Menten Equation Lineweaver-Burk Plot or Double-Reciprocal Plot	2	Fifth
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Enzymes	Enzyme inhibition -Competitive or Substrate Analogue Inhibitor -Noncompetitive Inhibitors -Uncompetitive Inhibitor -Allosteric enzyme -Isoenzyme -Therapeutic Use of Enzymes	2	Sixth
		First Exam		2	Seventh
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen	Vitamins and Enzyme Cofactors	-Difinition and classification of vitamins	2	Eighth

	3-Video lectures via electronic classes		-Classification different between fat soluble and water soluble vitamins -Thiamine (Vitamin B1) -Riboflavin (Vitamin B2)-Niacin (Vitamin B3)-		
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Vitamins Enzyme Cofactors	-Pantothenic Acid (Vitamin B5) -Pyridoxine (Vitamin B6) Biotin- Folic Acid- Cobalamin (Vitamin B12)- Vitamin C (Ascorbic Acid)-	2	Ninth
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Vitamins and Enzyme Cofactors	Fat soluble vitamins- Vitamin A- Vitamin D (Cholecalciferol)- Vitamin E (Tocopherol)- Vitamin K-	2	Tenth
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Hormones	Classification of hormones Classification Based on Chemical Structure Classification Based on Mechanism of Hormone Action	2	Eleventh
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Hormones	Mechanism of hormones action at cytosolic or nuclear level Cell membrane receptor mechanism of hormone action c-AMP second messenger	2	Twelfth
Daily, Weekly, Semester and Final Exams	1-Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Bioenergy	-Free energy is the useful energy in a system -Biologic Systems Conform to the General	2	Thirteenth

			Laws of Thermodynamics Endergonic process produced by coupling to exergonic process High energy phosphates compounds		
Daily, Weekly, Semester and Final Exams	Paper lectures 2-Electronic screen 3-Video lectures via electronic classes	Bioenergy	-The Intermediate Value for the Free Energy of Hydrolysis of ATP Has Important Bioenergetic Significance -High energy phosphates act as the cell currency of the cell -ATP Allows the Coupling of Thermodynamically unfavorable Reactions to Favorable Ones -Other Nucleoside Triphosphates Participate in the Transfer of High-Energy Phosphate -Integration of metabolism	2	fourteenth
		Semester Exam		2	fifteenth

Course StructureBiochemistry 2/ Practical					
Evaluation Method	Teaching Method	Unit/Course or Topic Name	Required learning outcomes	Hours	Week
Weekly Exams	-Paper lectures-Electronic screen	Photometry Spectrophotometer	Identify the parts of the system and its benefits and apply Lambert-Beer's law	3 hours	1
Weekly Exams	1-Paper lectures 2-Electronic screen	General Qualitative Detection of Proteins	Study and know the discoveries that distinguish different types of proteins	3 hours	2
Research on	-Paper lectures-	Protein precipitation methods	Study of protein precipitation methods	3	3

carbohydrate detectors and subsequent evaluation	Electronic screen		(salting in & salting out)		
Weekly Exams	-Paper lectures-Electronic screen	Determination of pI value of a protein	Using different concentrations of salts	3	4
Weekly Exams	-Paper lectures-Electronic screen	Quantitative method for protein estimation (Biuret method)	Using different solvents	3	5
Weekly Exams	-Paper lectures-Electronic screen	Enzyme kinetics	Using acidic and basic solutions	3	6
Weekly Exams	-Paper lectures-Electronic screen	Enzyme kinetics	Using heavy metals	3	7
		Exam	Determining the PI value at which the protein precipitates	3	8
Weekly Exams	-Paper lectures-Electronic screen	Enzyme Kinetics	Quantitative protein estimation and knowing the protein concentration	3	9
Weekly Exams	-Paper lectures-Electronic screen	Enzyme Kinetics	Studying the optimal substrate concentration for the enzymatic reaction	3	10
Weekly Exams	-Paper lectures-Electronic screen	Enzyme Kinetics	Studying the optimal pH for the enzymatic reaction	3	11
Weekly Exams	-Paper lectures-Electronic screen	Estimation of α-amylase activity in saliva	Study of the effectiveness of the enzyme alpha amylase	3	12
Research on amino acid reagents and subsequent evaluation	-Paper lectures-Electronic screen	Vitamin C	Vitamin C estimation in fruits	3	13

Weekly Exams	-Paper lectures- Electronic screen	Detection of some intermediate metabolites	Study and knowledge of the detections of some intermediate metabolites such as pyruvate, acetyl-CoA and alcohol	3	14
		Exam			15

11. Infrastructure	
1- Required textbooks	Introduction to general, organic, and biochemistry. Tenth Edition. Morris Hein; Scott Pattison and Susan Arena - Introduction to Organic and Biochemistry, Seventh Edition. Frederick A. Bettelheim, William H. Brown, Mary K. Campbell, Shawn O. Farrell
2- Main references (sources)	Biochemistry, by Pankaja Naik, 2nd ed. 2007. Jaypee Brothers ➢ Principles of Biochemistry, lehninger, 5th ed. 2008
A- Recommended books and references	Harper's: Illustrated Biochemistry,3rd ed.2015.
B- Electronic references and websites...	Many sites that deal with biochemistry, including medical sites.

12. Curriculum development plan
Follow up on internet references and research published in international journals as well as modern books, if available, to keep pace with the great development in biochemistry.

Course Description Form

For the Fourth Stage

First Semester

2022-2023

Course Description / Polymer 1

This course description provides students with the basics of polymer science, naming polymers, classifying polymers according to different classification bases, explaining the chemical reactions used in preparing polymers with mechanics, in addition to the nature of polymer reactions.

University of Baghdad / College of Science	1. Educational Institution
Department of Chemistry	2. University Department/Center
Polymer-1- 451 ChPS	3. Course Name/Code
Weekly in-person	4. Available Attendance Forms
First semester / 2023-2022	5. Semester/Year
30 hours = 15 x 2 hours	6. Number of Study Hours (Total)
/20229/1	7. Date this Description was Prepared

1. Course Objectives

The objective of teaching Polymer 1 for the fourth stage/first semester is to teach the student the basics of polymer science, naming polymers, classifying polymers according to different classification bases, explaining the chemical reactions used in preparing polymers with mechanics, in addition to the nature of polymer reactions.

As well as providing the student with comprehensive information about the specifications of polymers and their applications in various fields and processing methods and keeping pace with the scientific and applied development of polymer chemistry.

2. Learning outcomes and teaching, learning and evaluation methods

A- Cognitive objectives

A1. Enabling students to obtain knowledge of the chemical structures of polymers and methods of naming them

A2. Enabling students to obtain the highest knowledge of the different methods of preparing polymers

A3. Enabling students to obtain knowledge of the various applications of polymers in various fields

Teaching and learning methods

1. Providing students with basic information and additional topics related to the outputs of thinking and analysis of polymer chemistry.

2. Raising some topics that require thinking and analysis by following the discussion method with the students during the lecture.

3. Assigning students homework

Evaluation Methods

Conducting short exams every week to encourage students to read continuously and follow the subject.
Evaluating students on their participation in scientific discussions during lectures.
1. Conducting monthly

B - Program specific skill objectives:
B1 - Scientific and practical skills
B2 - Reminding and analyzing skills
B3 - Use and development skills
Teaching and learning methods
Providing students with the basics and topics related to knowledge and systems explained in:
1 - Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using LCD screens and (Data show)
2- Providing students with knowledge through homework assignments for study vocabulary
3 - Asking students to visit the library to obtain academic knowledge related to study vocabulary
4 - Improving students' skills by visiting websites to obtain additional knowledge of study materials
5- Brainstorming during the lecture
Evaluation methods
Daily tests with multiple-choice questions for study materials
- Participation grades for difficult competitive questions for students
- Setting grades for assigned homework
- Qualitative and quantitative practical tests in laboratories
C- Emotional and value objectives
C1 - Enabling students to solve problems related to In the intellectual framework of chemistry
Part 2 - Enabling students to solve problems related to international chemistry standards
Part 3 - Enabling students to solve problems related to the laws of control and quality of chemistry
Part 4 - Enabling students to solve problems related to chemistry and in the English language

Teaching and learning methods

Providing students with the basics and additional topics related to the previous educational outcomes of problem-solving skills

Scientific

- Solving a set of practical examples by the academic staff

- Participation of students during the lecture to solve some scientific issues

Evaluation methods

- Daily exams with multiple-choice questions that require scientific skills

- Daily exams with scientific and practical questions

- Participation grades for competition questions for academic topics

- Setting grades for homework

- Assigning students to do scientific seminars and discuss them

D - General and transferable qualification skills (other skills related to employability and personal development).

D1 - Enabling students to think and analyze topics related to the intellectual framework and international chemical standards
D2 - Enabling students to think and analyze topics related to company laws and chemical auditing standards
D3 - Enabling students to think and analyze topics related to language systems for importing chemicals
D4 - Enabling students to think and analyze topics related to chemistry in English
Teaching and learning methods
- Providing students with the basics and additional topics related to the outputs of thinking and chemical analysis
- Forming discussion groups during lectures to discuss chemical topics that require thinking and analysis
- Asking students to ask a set of thinking questions during lectures such as what, how, when and why for specific topics
- Giving students homework that requires self-explanations in causal ways
Evaluation methods
- Daily exams with self-solved homework questions
- Participation grades for competitive questions related to the subject matter

Course structure .2

Evaluation Method	Teaching Method	Name of the unit / course or topic	Required learning outcomes	hours	Week
Oral and Written Exams	Giving the lecture directly with diagrams, equations and illustrative examples	Introduction to polymer chemistry and classification principles	Introducing the student to the nature of polymer science	2	1
Oral and Written Exams	Giving the lecture directly with diagrams, equations and illustrative examples	Naming polymers by different systems	Introducing the student to the naming of polymers	2	2
Oral and Written Exams	Giving the lecture directly with diagrams, equations and illustrative examples	Types of copolymers, their naming and properties	Introducing the student to copolymers	2	3
Oral and written exams	Give a live lecture with diagrams, equations and illustrative examples	Classification of polymers on the basis of technology	Identifying the types of polymers technology	2	4
Oral and written exams	Give a live lecture with diagrams, equations and illustrative examples	Classification of polymers according to preparation reactions	Identify the types of polymers	2	5

			according to their preparation		
Oral and written exams	Give a live lecture with diagrams, equations and illustrative examples	Classification of polymers according to chain growth mechanism	Identify the types of polymers according to the structure of the chains	2	6
Oral and written exams	Give a live lecture with diagrams, equations and illustrative examples	Polymerization techniques by suspensions, emulsions, solutions and interfacial polymerization	Identify the different polymerization techniques	2	7
Oral and written exams	Give a live lecture with diagrams, equations and illustrative examples	Advantages of condensation polymerization with classification of polyester types, their properties and preparation	Introduce the student to condensation polymerization and polyesters	2	8
Oral and written exams	Give a live lecture with diagrams, equations and illustrative examples	Types of polyamides and different types of resins, specifications/preparation and application	Introduce the student to polyimides and types of resins	2	9
Oral and written exams	Give a live lecture with diagrams, equations and illustrative examples	Mechanics, kinetics and characteristics of radical polymerization with examples of radical polymers, specifications, preparation methods and applications	Introduce the student to radical polymerization and polymers prepared by radical polymerization	2	10
Monthly exam				2	11

	1. Infrastructure
Updated Macromolecular Chemistry / Written by Dr. Korkis Abdul Adam and Dr. Dhnoon Mohammed Aziz	1. Required textbooks
	2. Main references and sources
Polymer synthesis , theory and practice 4th edition , D.Braun, H.Cherdom, M.Rehahn(2005). Polymer chemistry by Seymow, carrahers5th edition	(Recommended books and references)(Scientific journals, reports..)
	(Electronic reference, websites,...)

	12. Curriculum development plan
Assigning students to complete reports related to the various topics of the course, including the latest in scientific journals and books on these topics, which broadens the student's vision of the course materials and knowledge of everything new and developed in them. Organizing field visits for students to factories, laboratories and institutions that deal with various polymeric materials so that the student can learn about the importance of these polymers and how to manufacture them in	The curriculum can be developed through:

laboratories and how to benefit from them in producing various polymeric goods with	
Assigning students to complete reports related to the various topics of the course, including the latest in scientific journals and books on these topics, which broadens the student's vision of the course materials and knowledge of everything new and developed in them. Organizing field visits for students to factories, laboratories and institutions that deal with various polymeric materials so that the student can learn about the importance of these polymers and how to manufacture them in laboratories and how to benefit from them in producing various polymeric goods with	12. Curriculum development plan

Course Description / Petrochemicals 1

This course description provides a concise summary of the main features of the course and the learning outcomes expected of the student, demonstrating whether the student has made the most of the learning opportunities available. It must be linked to the programme description.

University of Baghdad / College of Science	Educational Institution
Department of Chemistry	University Department/Center
Petrochemicals (1) Dr. Zainab Abdul Zahra	Course Name/Code
Lists of names of students according to groups A1, A2, B1, B2	Available Attendance Forms
First semester / 2022-2023	Semester/Year
4 hours per week (morning study)	Number of Study Hours (Total)
1/10/2022	Date of Preparation of this Description
	Course Objectives
The objective of teaching Petrochemicals (1) for the fourth stage / first semester is to identify the primary natural resources (natural gas and crude oil) for the production of petrochemical materials and to study the types, properties, chemical components and chemical processes of natural gas and crude oil. The course also aims to identify the processes of refining and processing crude oil and how to obtain petroleum products and employ them to produce petrochemicals and to study industrial processes and how to produce industrial gas and use it to produce many industrially important petrochemicals such as ammonia, ammonium nitrate, urea, hydrazine, nitric acid, methanol,	

formaldehyde, acetaldehyde, acetic acid, MTBE, TAME, PTFE, EO, EG, ethanolamine, vinyl chloride, acrolein and acrylic acid .. etc

1. Learning outcomes, teaching and learning methods and assessment

A- Knowledge and understanding

A1- Identify the natural sources of energy, which are natural gas and crude oil.

A2- Study the processes of refining crude oil and testing petroleum derivatives.

A3- Study the processes of producing industrial gas.

A4- Study the most important chemical processes and reaction conditions for producing basic petrochemical materials in the industry.

B- Course-specific skills

B1- Training the student to write and discuss research and reports related to the production of petrochemical materials.

B2- Teaching by asking questions and finding appropriate solutions to industrial problems through discussion in the lecture.

Teaching and learning methods

- Explaining the scientific material using power point technology and educational videos.
- Presenting the scientific material in the electronic class and YouTube channel
- Using the World Wide Web (Internet) to follow up on developments in the petrochemical industry.
- Giving the lecture directly via the Meet Google program.

Evaluation methods

- Periodic monthly exams.
- Short surprise exams.
- Evaluating the student's performance and discussion in the lecture.
- Evaluating homework and industrial reports.

C- Emotional and value-based objectives

C1- Listening to students, knowing their skills and developing them, and striving to solve their problems.

C2- Guiding students and urging them to study, excel, and challenge the obstacles they face.

D- General and transferable skills (other skills related to employability and personal development).

D1- Discussing students' research and reports and honoring outstanding students.

D2- Developing personal skills through their participation in scientific and artistic exhibitions and sports activities.

D3- Students' contribution to volunteer work and community service.

2. Course Structure

Week	hours	Required Learning Outcomes	Name of unit/course or topic	Teaching Method	Evaluation Method
First	2	The importance of the petrochemical, oil and gas industry in Iraq	Petrochemicals industry	Lectures	Questioning and Discussion
Second and Third	4	Types, characteristics and components of natural gas and crude oil	Primary raw materials	Lectures	Homework
Fourth	2	Refining processes for crude oil and petroleum products	Crude oil refining	Lectures	Short Exam

Short Exam	Lectures	Synthesis gas	Sources, production and uses of industrial gas	2	Fifth
First exam				2	Sixth
Short Quiz	Lectures	Chemicals based on synthesis gas	Petrochemicals based on industrial gas (ammonia and its derivatives)	2	Seventh
Evaluation of Homework Solutions	Lectures	Chemicals based on synthesis gas	Petrochemicals based on industrial gas (methanol and its derivatives)	2	Eighth
Homework Solutions Evaluation	Lectures	Paraffin-Based Chemicals	Petrochemicals resulting from the oxidation of paraffins	2	Ninth
Homework Solutions Evaluation	Lectures	Paraffin-Based Chemicals	Halogenation, nitration and sulfonation of paraffins to produce various petrochemicals	2	Tenth
Second exam				2	Eleventh
Short exam	Lectures	Olefin-Based Chemicals	Petrochemicals based on olefins	4	Twelfth and Thirteenth
Direct discussion with students on the reports prepared by them				4	14 و15

1. Infrastructure	
The Petrochemicals, Hazim K. Yahya & Faaz A. Al-Kader.	1- Required textbooks
Chemistry of Petrochemical Processes, 2nd ed., Sami Matar & Lewis F. Hatch.	3- Main references -1 (sources)

Course Description / Spectral Diagnosis of Compounds

This course description provides students with education in organic chemical reactions and chemical structures, knowledge of the structure of organic compounds, and how to explain the mechanism of organic reactions and their practical applications aimed at the scientific development of organic chemistry.

University of Baghdad D / College of Science	1. Educational institution
Chemistry	2. Academic department/center
Spectrometric Diagnosis of Organic Compounds 454 ChIO	3. Course name/code
Weekly in-person	4. Available forms of attendance
First Semester of the Year 2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
1/9/2022	7. Date this description was prepared
1. Course objectives: Teaching the student organic chemical reactions and chemical structures, knowing the structure of organic compounds, and how to explain the mechanism of organic reactions and their practical applications aimed at the scientific development of organic chemistry.	

1. Learning outcomes and teaching, learning and assessment methods

A- Cognitive objectives

A1- Enable students to gain knowledge and understanding of organic chemistry.

A2- Enable students to gain knowledge and understanding of the chemical structures of organic compounds.
A3- Enable students to gain knowledge and understanding of the mechanism of organic reactions.
A4- Enable students to gain knowledge and understanding of practical experiments in organic chemistry.
A5- Enable students to gain knowledge and understanding of the physical and chemical properties of organic compounds.
B- Course specific skill objectives
B1- Practical skills.
B2- Recall and analysis skills.
B3- Use and development skills.
Teaching and learning methods
- Providing students with the basics and additional topics related to the outcomes of thinking and organic chemical analysis.
- Forming discussion groups during lectures to discuss organic chemistry topics that require thinking and analysis.
- Asking students to solve a set of thinking questions during lectures such as what, how, when and why for specific topics.

- Giving students homework that requires self-explanations in causal ways.
Evaluation methods

- Daily exams with self-solved homework questions.
- Participation marks for competitive questions related to the subject matter.
- Marks specified for homework.
- Analysis of organic compounds and deduction of their chemical and physical properties (melting and boiling points).
- Preparation of organic compounds (medicines, industrial dyes).
C- Emotional and value objectives
C1- Enabling students to solve problems related to the intellectual framework of organic chemistry.
C2- Enabling students to solve problems in preparing and diagnosing organic compounds.
C3- Enabling students to solve problems related to organic chemistry and in the English language.
Teaching and learning methods

It is noted that our dear students are aware and conscious that they are undergraduate students and committed to reading, attending daily lectures, taking short and monthly exams, and adhering to university laws and regulations.
Evaluation methods

Holding some courses and seminars in the department plays a major role in educating our dear students and constructive discussion between the student and the professor.

Scientifically distinguished students and participants in seminars held in the College of Science are evaluated and rewarded.

Organizing scientific trips to some factories to learn about the production stages.

D - General and transferable qualification skills (other skills related to employability and personal development).

D1- Following up on scientific development by contacting international universities via the Internet.

D2- Participating in scientific conferences inside and outside the country.

D3- Participating in scientific workshops and seminars inside and outside the country.

D4- Field visits to organic industrial projects.

10. Course structure

Evaluation Method	Teaching method	Name of unit/course or topic	Required Learning Outcomes	hours	Week
Oral and Written Exams	Data show with white board	Chapter I: Ultraviolet Spectrometry	Introducing the student to the science of ultraviolet spectra	2	1st
Oral and Written Exams	Data show with white board	-Introduction -Theory and Sample handling	Introduction and theory	2	2nd
Oral and Written Exams	Data show with white board	-characteristic Absorption of Organic Compounds	Identification and absorption of organic compounds	2	3rd
Oral and Written Exams	Data show with white board	Chapter II: Infrared Spectrometry	Introducing the student to the science of infrared spectra	2	4th
Oral and Written Exams	Data show with white board	-Introduction -Theory and Instrumentation	Introduction and theory	2	5th
Oral and Written Exams	Data show with white board	- Sample handling -Interpretation of Spectra		2	6th
Oral and Written Exams	Data show with white board	-characteristic group frequencies of Organic molecules		2	7th

Oral and Written Exams	Data show with white board	Chapter III: proton magnetic Resonance Spectrometry		2	8th
Oral and Written Exams	Data show with white board	- Introduction		2	9th
Oral and Written Exams	Data show with white board	Theory and Apparatus		2	10th
Oral and Written Exams	Data show with white board	Sample handling		2	11th
Oral and Written Exams	Data show with white board	-Chemical Shift and Simple Spin-Spin Coupling		2	12th
Oral and Written Exams	Data show with white board	-protons on Heteroatoms		2	13th
Oral and Written Exams	Data show with white board	-Coupling of Protons to other Nuclei		2	14th
Oral and Written Exams	Data show with white board	Chemical shift equivalence and magnetic equivalence		2	15th

11. Infrastructure

- Required textbooks

1- R.T. Morrisson and R.N. Boyd, "Organic Chemistry", 6th ed., Paramount Communication Company (1992).

2- A.I.Vogel, "Text Book of Practical Organic Chemistry", 3rd ed., Longman Group Ltd., London (1974).

3- J. Balfour, "Indigo", British Museum Press (1998).

- Main references (sources)

4- R.T. Morrisson and R.N. Boyd, "Organic Chemistry", 6th ed., Paramount Communication Company (1992).

5- A.I.Vogel, "Text Book of Practical Organic Chemistry", 3rd ed., Longman Group Ltd., London (1974).

6- J. Balfour, "Indigo", British Museum Press (1998).

-7 D.J. Raber and N.K. Raber", Organic Chemistry", West Publishing Company (1988).
-8 N. Rose and S. Rome, J. hem. Educ., 1970, 47, 649.
-9 Austria Patent, 234, 511, Nov. 16, 1880.
-10 United State Patent 4, 145, 349 Mar. 20, 1979.
United State Patent 4, 464, 537 Aug. 7, 1984.

- (Recommended books and references)
(scientific journals, reports..)
- (Electronic reference, websites,...)

12. Curriculum development plan
Updating scientific material Using modern technologies

Course Description / Practical Organic Diagnosis

This course description provides the organic diagnosis of organic compounds according to the steps of systematic diagnosis using organic reagents and provides students with advanced concepts of applied organic chemistry.

University of Baghdad D /	1. Educational institution
Chemistry	2. Academic department/center
Organic Diagnostic Laboratory 455 ChPiO	3. Course name/code
Weekly in-person	4. Available forms of attendance
First semester of the year 2023-2022	5. Semester/year
60 hours = 15 x 4 hours	6. Number of study hours (total)
1/9/2022	7. Date this description was prepared

1. Course Objectives

• Preparing human cadres with knowledge and awareness of chemistry sciences so that they become able to carry out teaching duties

• Performing organic diagnosis of organic compounds according to the steps of systematic diagnosis using organic reagents

• Providing students with advanced concepts of applied organic chemistry

• We work to provide laboratories equipped with the latest devices, chemicals and work equipment for the purpose of instilling the spirit of work and learning in a way that serves the labor market

.9. Course Outcomes, Teaching, Learning and Evaluation Methods

A- Cognitive Objectives

A1- Identify organic materials or compounds and how to diagnose them practically.
A2- Identify organic reagents and active groups in organic compounds to be diagnosed.
A3- Prepare new derivatives of the unknown organic compound to be diagnosed by reacting it with new compounds.

B- Course Skill Objectives

B1- Teaching the student to benefit from the Internet unit to extract research and summary reports on the prescribed practical material.
B2- Continuous discussion in the laboratory and asking some external questions to expand the student's understanding of the material and the student's continuous participation in the laboratory.

Teaching and learning methods

The scientific material is explained through approved organic books and the formation of paper lectures to explain the work of experiments in the laboratory.

Evaluation methods

Conducting short surprise exams so that the student is aware and continuously reading the lectures on the scientific material
Conducting comprehensive exams on experiments at the end of each course and evaluating reports.

C- Emotional and value-based objectives

C1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding ones among them.

C2- Developing personal skills by giving poetry debates through their participation in central celebrations held within the university..

Teaching and learning methods

It is noted that our dear students are aware and conscious that they are undergraduate students and committed to reading, attending the daily laboratory, taking short and comprehensive exams, and adhering to university laws and regulations.

Evaluation methods

Holding some courses and seminars in the department has a major role in educating our dear students and constructive discussion between the student and the professor.

Scientifically distinguished students and participants in seminars held in the College of Science are evaluated and rewarded.
Scientific trips to some factories are held to learn about the production stages.

D - General skills and transferable qualification (other skills related to employability and personal development). D1- The graduate student acquires the skill of how to diagnose organic compounds practically. D2- The student learns how to deal properly with the chemical substance and how to be careful with it.					
.10. Course structure					
Evaluation Method	Teaching method	Name of unit / course or topic	Required learning outcomes	Hours	Week
Quizzes with reports.	Paper lectures with a blackboard.	Measuring m.p, b.p of organic compounds and conducting combustion detection.	Knowledge of measuring the melting and boiling points of organic materials and knowing the organic material whether it is aliphatic, aromatic, cyclic or carbohydrate.	4	1
Quizzes with reports.	Paper lectures with a blackboard.	Sodium melting and solubility detection	Detect the presence of nitrogen, sulfur and halogens in organic compounds and know their solubility.	4	2
Quizzes with reports.	Paper lectures with a blackboard.	Conducting oxygen active groups detections.	Knowledge of the active oxygen groups in organic compounds.	4	3
Quizzes with reports.	Paper lectures with a blackboard.	Conducting nitrogen active groups detections.	Knowledge of the active nitrogen groups in organic compounds.	4	4
Quizzes with reports.	Paper lectures with a blackboard.	First unknown	How to diagnose organic compounds in unknowns.	4	5
Quizzes with reports.	Paper lectures with a blackboard.	Derivative of first unknown	How to diagnose organic compounds in unknowns.	4	6
Quizzes with reports.	Paper lectures with a blackboard.	Second unknown with derivative	How to diagnose organic compounds in unknowns.	4	7
Short exams with reports.	Paper lectures with a board.	The third unknown with its derivative	How to diagnose organic compounds in unknowns.	4	8
Short exams with reports.	Paper lectures with a board.	The fourth unknown with its derivative	How to diagnose organic compounds in unknowns.	4	9
Short exams with reports.	Paper lectures with a board.	The final unknown with its derivative	Required learning outcomes	4	10
			Final exam		11

11. Infrastructure

- Required textbooks

كتاب التشخيص النظامي R.T. Morrisson and R.N. Boyd, "Organic Chemistry", 6th ed., Paramount Communication Company (1992).

A.I.Vogel, "Text Book of Practical Organic Chemistry", 3rd ed., Longman Group Ltd., London (1974).

J. Balfour, "Indigo", British Museum Press (1998).

- Main references (sources)

D.J. Raber and N.K. Raber", Organic Chemistry", West Publishing Company (1988).
N. Rose and S. Rome, J. hem. Educ., 1970, 47, 649.
Austria Patent, 234, 511, Nov. 16, 1880.
United State Patent 4, 145, 349 Mar. 20, 1979.
United State Patent 4, 464, 537 Aug. 7, 1984.

- (Recommended books and references)
(scientific journals, reports..)
- (Electronic reference, websites,...)

12. Curriculum development plan
Updating the scientific material by Using modern technologies

Course Description / Biochemistry 3

This course covers chemical concepts related to the structural and functional classification of carbohydrate and lipid metabolism, the mechanism of their absorption and transport across biological membranes, and a set of experiments designed to teach and train students on the most common methods and devices used in biochemistry.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Biochemistry (3) / 450 ChBC	3. Course name/code
In-person	4. Available forms of attendance
First Semester / 2023-2022	5. Semester/year
30 theoretical hours + 45 practical hours	6. Number of study hours (total)
1/9/2022	7. Date this description was prepared

1. Course Objectives
1-The aim of teaching biochemistry is to identify metabolic pathways from the energy calculations side.
2-Linking metabolic pathways of biomolecules
3-Studying the harmony and integration in the function of vital organs of the human body in different nutritional states: in the case of fasting and famine or in the case before and after meals.
4-Studying what happens to energy levels in each nutritional state
5-Diseases resulting from a malfunction in the function of vital organs

1. Course Outcomes, Teaching, Learning and Evaluation Methods
- Cognitive Objectives.
1- Enable students to gain knowledge and understanding of the intellectual framework of chemistry 2- Enable students to gain knowledge and understanding of international chemical standards 3- Enable students to gain knowledge and understanding of the laws of chemistry 4- Enable students to gain knowledge and understanding of the standards of chemical analysis 5- Enable students to gain knowledge and understanding of the law of misuse of chemicals 6- Enable students to gain knowledge and understanding of chemistry systems 7- Enable students to gain knowledge and understanding of chemistry in English B- Program Skills Objectives: B1- Scientific and practical skills B2- Recall and analysis skills B3- Use and development skills
Teaching and learning methods
Providing students with the basics and topics related to knowledge and systems explained in: 1- Clarifying and explaining the study materials by the academic staff through the whiteboard and using PowerPoint using LCD screens and (Data show) 2- Providing students with knowledge through homework assignments for the study vocabulary 3- Asking students to visit the library to obtain academic knowledge related to the study vocabulary

4- Improving students' skills by visiting websites to obtain additional knowledge of the study materials
5- Brainstorming during the lecture
Evaluation methods
Daily tests with multiple-choice questions for the study materials
- Participation grades for difficult competitive questions for students
- Setting grades for the assigned homework
- Qualitative and quantitative practical tests in laboratories

C- Emotional and value-based objectives

C1 - Enabling students to solve problems related to the intellectual framework of chemistry

C2 - Enabling students to solve problems related to international chemistry standards

C3 - Enabling students to solve problems related to the laws of control and quality of chemistry

C4 - Enabling students to solve problems related to chemistry and in the English language

Teaching and learning methods

Providing students with the basics and additional topics related to the previous educational outcomes of skills to solve problems

Scientific

- Solving a set of practical examples by the academic staff

- Participation of students during the lecture to solve some scientific issues

Evaluation methods

- Daily exams with multiple-choice questions that require scientific skills

- Daily exams with scientific and practical questions

- Participation grades for competition questions for academic topics

- Setting grades for homework

- Assigning students to do scientific seminars and discuss them

D - General and transferable qualification skills (other skills related to employability and personal development).

D1 - Enable students to think and analyze topics related to the intellectual framework and international chemical standards
D2 - Enable students to think and analyze topics related to company laws and chemical audit standards
D3 - Enable students to think and analyze topics related to language systems for importing chemicals
D4 - Enable students to think and analyze topics related to chemistry in English

10. Course structure Biochemistry 3 / Theoretical

Evaluation Method	Teaching Method	Unit name/topic	Required learning outcomes	hours	Week
Daily, Weekly, Semester and Final Exams	1-Paper Lectures 2-Electronic Screen	General introduction to metabolism	A:Biological membranes - Transport systems B: Source of carbon ,Nitrogen &energy	2	1

Daily, Weekly, Semester and Final Exams	1-Paper Lectures 2-Electronic Screen	Carbohydrate metabolism	Carbohydrate metabolism A:Digestion absorption and transport of carbohydrate B: Glycolysis (calculation of energy)	2	2
Daily, Weekly, Semester and Final Exams	1-Paper Lectures 2-Electronic Screen	Carbohydrate metabolism	A: Metabolism of other important sugars B: Citric acid cycle (calculation of energy)	2	3
Daily, Weekly, Semester and Final Exams	1-Paper Lectures 2-Electronic Screen	Carbohydrate metabolism	A: Gluconeogenesis. and Cori cycle(Lactic acidosis). B:Glycogenolysis and Glycogenesis	2	4
Daily, Weekly, Semester and Final Exams	1-Paper Lectures 2-Electronic Screen	Carbohydrate metabolism	A:Glycogenolysis and Glycogenesis (cont.) B:Pentose phosphate pathway	2	5
Daily, Weekly, Semester and Final Exams	1-Paper Lectures 2-Electronic Screen	Carbohydrate metabolism	Electron Transfer Chain & Oxidative phosphorylation	2	6
		First exam		2	7
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Lipid metabolism	Digestion absorption and transport of lipid	2	8
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Lipid metabolism	Fatty acid oxidation -Activation of Fatty Acid -Transport of Acyl-CoA into Mitochondria by Carnitine Transport System -β-oxidation -Energy yield from the β-oxidation of fatty acids	2	9

Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Lipid metabolism	--β-oxidation of a Fatty Acid with an Odd Number of Carbon Atoms -Beta oxidation of unsaturated fatty acids -Alpha-oxidation	2	10
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Lipid metabolism	Metabolism of keton bodies Ketogenesis Utilization of Ketone Bodies Ketoacidosis	2	11
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Lipid metabolism	-DE NOVO synthesis of fatty acids)Lipogenesis -Synthesis of lomg chain fatty acids	2	12
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Lipid metabolism	Triacyl glycerol metabolism - Synthesis of Triacylglycerol in Adipose Tissue - Degradation of Triacylglycerols in Adipose Tissue -Lipoprotein metabolism	2	13
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Lipid metabolism	Cholesterol metabolism -De Novo Synthesis of Cholesterol -Degradation of Cholesterol	2	14
		Semester exam		2	15

Course Structure Biochemistry 3/Practical

Evaluation Method	Teaching method	اسم الوحدة / المساق أو الموضوع	Required Learning Outcomes	Hours	Week
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Collection and handling of blood and urine samples.	Learn how to collect blood and urine samples and how to handle them	3	1
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Blood glucose	Estimate blood sugar concentration	3	2
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Renal function test: -Blood urea.	Study kidney function tests	3	3
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	-Blood uric acid.	Estimate urea in blood serum	3	4
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	-Plasma creatine and creatinine	Estimate uric acid	3	5
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Lipid profile Serum cholesterol (Total).	Creatine and creatinine in blood serum and plasma	3	6
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Scheme for salt fraction of serum proteins: -Total proteins.	Estimate total lipids in blood serum	3	7
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	-(Albumin + α-globulin). -Albumin. -γ-globulin.	Estimation of albumin and globulin in serum	3	8

Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Liver function test in blood: -Serum bilirubin.	Study of liver function tests	3	9
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	-Serum phosphatases.	Estimation of bilirubin in serum	3	10
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	-Serum transaminases.	Estimation of phosphatase in serum	3	11
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Minerals: -Serum calcium. -Serum phosphates	Estimation of transaminase in serum	3	12
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Pancreatic test: Serum α-Amylase.	Estimation of calcium and phosphate in serum	3	13
Daily, Weekly, Semester and Final Exams	1- Paper lectures 2- Electronic screen	Qualitative test of various constituents of saliva.	Quantitative estimation of different saliva components	3	14
		exam		3	15

	11. Infrastructure
- Ferrier D. R. *"Lippincott's Illustrated Reviews:Biochemistry"*, 7th Ed. Wolters Kluwer.2017. -Naik P. *"Essentials of Biochemistry"*, 1st ed. 2012. - Cample biology, 9th edition 2009. Jane B. Reece, Lisa A Urry, Micheal L. Cain.	1- Required textbooks
Biochemistry, 3th edition 2008. Mathews, Van Holde, Ahern	2- Main references (sources)

-Nelson D.L. & Cox M.M., *"Lehninger Principles of Biochemistry"*, 5th ed., W.H. Freeman and company, New York. 2014. - Rodewell V.W. , Bender D.A., etal "*Harper's Illustrated Biochemistry*". 31st ed., Mc Graw-Hill Companies, New York. 2018.	A- Recommended books and references
Many sites that deal with biochemistry, including medical sites.	(scientific journals, reports,.....)

12. Curriculum development plan
Updating the scientific material Using modern technologies

Course Description / Instrumental Analysis Chemistry 1

This course description provides students with the basics of using each device used in analytical chemistry, teaching students the uses of these devices and how to benefit from them in the field of determining the quality and quantity of the substance to be measured.	
University of Baghdad - College of Science	1. Educational institution
Department of Chemistry	2. Academic department/center
Instrumental Analysis Chemistry 449 ChIA/-1-	3. Course name/code
In-person	4. Available forms of attendance
First Semester/2023-2022	5. Semester/year
30 theoretical hours + 45 practical hours	6. Number of study hours (total)
1/9/2022	7. Date this description was prepared
	1. Course Objectives

1- Students are introduced to the basics of each device used in instrumental analysis chemistry
2- Teaching students the basics that depend on the use of each device used in instrumental analysis chemistry
3- Teaching students the uses of these devices and how to benefit from them in the field of qualitative and quantitative determination of the material to be measured.
4- Teaching students the practical applications of these devices in the fields of measuring the materials to be determined.
5Students are taught on many devices, including: UV and visible spectrophotometry IR spectrophotometry Fluorescence ,phosphorescence and chemiluminescence Turbidimetry and Nephelometry Flow injection Flam atomic emission .flame atomic, absorption non flame, atomic absorption ,plasma atomic emission. X-rayemission ,X-ray fluorescence Dervative spectrometry and laser spectrometry

1. Course Outcomes, Teaching, Learning and Evaluation Methods
A- Cognitive Objectives
A1- Practical Skills A2- Analysis and Deduction Skills A3- Development Skills B- Course Skills Objectives B1- Scientific and theoretical progression in understanding the foundations of analytical chemistry B2- Scientific convergence between theoretical approaches and practical reality B3- Finding appropriate ways to estimate and analyze chemical materials qualitatively and quantitatively
Teaching and learning methods
1- Using known learning methods through explaining the theoretical material 2- Using the board and the electronic screen as a means to display important information during the explanation 3- Relying on the basic book in giving the student the scientific foundations 4- Raising a set of thinking questions during lectures, which increases and motivates students to analyze and conclude 5- Giving students homework that requires self-explanations
Evaluation methods
1- Monthly written tests 2- Asking inferential questions during the lecture and preparing homework 3- Conducting a quick daily exam during the lecture time 4- Students must be involved in the scientific discussion during the lecture

5- Scientific and literary commitment is a priority in the evaluation process

C- Emotional and value-based goals

C1- The student feels that he is a scientific part of the scientific institution

C2- Building a generation of scientific pillars, the aim of which is to preserve the main role of the scientific curriculum

C3- Bringing the student to the stage of scientific and human awareness, which can be invested in the future

C4- Linking the lecture curriculum to practical applications, especially with our daily lives

Teaching and learning methods

1- Providing students with the basics and additional topics related to thinking outcomes

2- Discussing lesson topics that require thinking and analysis

3- Raising a set of thinking questions during lectures, which increases and motivates students to analyze and conclude

4- Giving students homework that requires self-explanations

Evaluation methods

1- Student activity in the lecture by answering oral and written questions and discussing the importance of automated analysis methods

2- Student attendance and commitment to lecture time

3- Daily and semester exams

D- General and transferable qualification skills (other skills related to employability and personal development).

D1-- Urging them to borrow scientific books from the college and department library to benefit from them scientifically

D2- Developing students' personal skills by developing them in the correct way

D3- Clarifying students' future goals, which generates a factor of scientific motivation

D4- Making the scientific institution the largest incubator for students, which generates a factor of belonging

Course structure .1

Evaluation Method	Teaching method	Unit Name / Topic	Required learning outcomes	hours	Week

Semester Exams and Weekly Reports	1-Electronic lectures 2-Electronic screen	Ultraviolet Spectroscopic Methods	UV and visible spectrophotometry ,principle ,instrumentation and application.	2	1
Semester Exams and Weekly Reports	1- -1 Electronic lectures 2- -2 Electronic screen	Infrared Spectroscopic Methods	IR spectrophotometry , principle ,instrumentation and application.	2	2
Semester Exams and Weekly Reports	1- -1 Electronic lectures 2- -2 Electronic screen	Fluorescence, Phosphorescence and Chemiluminescence Methods	Fluorescence ,phosphorescence and chemiluminescence , principle ,instrumentation and application.	2	3
Semester Exams and Weekly Reports	1- -1 Electronic lectures 2- -2 Electronic screen	Turbidity Methods	Turbidimetry and principle ,instrumentation and application.	2	4-5
Semester Exams and Weekly Reports	1- -1 Electronic lectures 2- -2 Electronic screen	Nephilometric Methods	Nephelometry, principle ,instrumentation and application.	2	6
First exam					7
Semester Exams and Weekly Reports	1-Electronic -1 lectures 2- -2 Electronic screen2	Atomic absorption spectroscopy	Atomic absorbance spectroscopy .	2	8
Semester Exams and Weekly Reports	1-Electronic lectures 2-Electronic screen	Atomic emission spectroscopy	Atomic emission spectroscopy		9

Semester Exams and Weekly Reports	1-Electronic lectures 2-Electronic screen	Atomic fluorescence spectroscopy	Atomic fluorescence spectroscopy		10
Semester Exams and Weekly Reports	1-Electronic lectures 2-Electronic screen	X-ray spectroscopy (absorption and fluorescence)	X-ray analysis absorbance and fluorescence		11
Semester Exams and Weekly Reports	1-Electronic lectures 2-Electronic screen	Flow injection spectroscopy	Flow injection analysis		12
Semester Exams and Weekly Reports	1-Electronic lectures 2-Electronic screen	Laser	Laser		13
Semester Exams and Weekly Reports	1- -1 Electronic lectures 2- -2 Electronic screen	Spectral derivative	Derivative spectroscopy		14
Second final exam					15

The increasing use of information technology or reliable Internet references as a result of keeping pace with the great development in the world of automated analysis technologies and the use of many examples in order to mature the student's scientific thinking.

Course Description / Quantum Chemistry and Spectra 1

This course description provides that modern chemistry relies entirely on quantum mechanics to understand the shapes of chemical systems and their interactions. This requires familiarity with the nature of the kinetic problem in general and the applications of the quantized eigenvalue equation in its various aspects. This course aims

University of Baghdad / College of Science	1. Educational Institution
Department of Chemistry	2. University Department/Center
Quantum Chemistry and Spectra (1)/First Course 448 ChQS	3. Course Name/Code
In-person	4. Available Attendance Forms
First Semester - 2023-2022	5. Semester/Year
30 hours = 15 x hours2	6. Number of Study Hours (Total)
1-9-2022	7. Date this Description was Prepared
1. Course Objectives	
Modern chemistry relies entirely on quantum mechanics to understand the shapes of chemical systems and their interactions. This requires	
to recognize the nature of the kinetic problem in general and the applications of the quantized eigenvalue equation in its various aspects. This lesson aims to enable the student to do this.	

1. Learning outcomes, teaching and learning methods and assessment
A- Cognitive objectives
A1- Identifying ancient quantum theories leading to modern quantum mechanics. A2- Linking theoretical results to practical A3- Introducing the student to the scientific foundations of most medical techniques through quantum mechanics, especially the Zeeman and Stark effect. B- Course specific skill objectives B1- Providing the opportunity to discuss the topic with students by solving problems and creating a spirit of competition among students
Teaching and learning methods
1- Benefit from the textbook (Introduction to Quantum Mechanics by Professor Dr. Muthanna Abdul Jabbar Shanshal).
2- Benefit from videos on the Internet about the topic of quantization.
Evaluation methods
• Requesting solutions to some problems.
• Conducting continuous monthly exams
• Student participation in the discussion and regular attendance + Google Forms attendance form
• Electronic student exam (directly via Google Forms) C- Emotional and value-based objectives C1- Thinking skills and scientific problem-solving skills C2- Enabling students to solve problems related to the intellectual framework of chemistry Teaching and learning methods - Providing students with the basics and additional topics related to previous educational outcomes for skills to solve scientific problems

- Solving a set of practical examples by the academic staff
- Asking students during the lecture to solve some scientific issues

Evaluation methods
- Daily exams with multiple-choice questions that require scientific skills
- Daily exams with scientific and practical questions
- Participation grades for competition questions for academic topics
- Setting grades for homework
- Assigning students to do scientific seminars and discuss them

D- General and transferable qualification skills (other skills related to employability and personal development).

D1 - Enabling students to think and analyze topics related to the intellectual framework

10. Course structure

Evaluation Method	Teaching method	Unit/Course or Topic Name	Required learning outcomes	hours	Week
Monthly in-person exams	1- Paper lectures 2- Electronic screen	Quantum Chemistry and Spectra (1)	Chapter 1 Energy Curve Energy Supersurface	4	1 -2
	1- Paper lectures 2- Electronic screen	Quantum Chemistry and Spectra (1)	Chapter 2. Review of Classical Mechanics	4	3- 4
	1- Paper lectures 2- Electronic screen	Quantum Chemistry and Spectra (1)	Chapter 3. Old Quantum Theory	6	5-7
	1- Paper lectures 2- Electronic screen	Quantum Chemistry and Spectra (1)	Chapter 4. Quantum Mechanics	4	8-9
	1- Paper lectures 2- Electronic screen	Quantum Chemistry and Spectra (1)	Chapter Five. Wave Mechanics, Schrödinger's Description of Quantum Mechanics ******** The curriculum of	6	10-12

			the subject given to the student has been reduced according to the Ministry's decision to give 65% of the prescribed subject		
	1- Paper lectures 2- Electronic screen	Quantum Chemistry and Spectra (1)	Chapter 6: Solutions of the Schrödinger equation for molecular systems	6	13-15

11. Infrastructure	
1- Introduction to Quantum Mechanics by Professor Dr. Muthanna Abdul Jabbar Shanshal	• Required textbooks
2- Questions and Solutions in Quantum Mechanics by Professor Dr. Rahab Majed Kabba Quantum Chemistry Third Edition John P. Lowe	• Main references (sources)
	• Recommended books and references (scientific journals, reports, etc.)
	• Electronic references, websites

12. Curriculum development plan
According to the requirements of the Ministry of Higher Education and Scientific Research, so that it is consistent with the latest local scientific trends and global scientific requirements.

Course Description Form

For the Fourth Stage

Second Semester

2022-2023

Course Description / Quantum Chemistry and Spectra 2

This course description provides an introduction to the nature of the kinematic problem in general and the applications of the quantized eigenvalue equation in its various aspects. This lesson aims to enable the student to do so.

University of Baghdad / College of Science	1. Educational Institution
Department of Chemistry	2. University Department/Center
Quantum Chemistry and Spectra (2)/ 456 ChQS	3. Course Name/Code
Weekly in-person	4. Available Attendance Forms
Second semester - 2023-2022	5. Semester/Year
30 hours = 15 x 2 hours	6. Number of Study Hours (Total)
1-9-2022	7. Date this Description was Prepared
1. Course Objectives	
Modern chemistry relies entirely on quantum mechanics to understand the shapes of chemical systems and their interactions. This requires	
to recognize the nature of the kinetic problem in general and the applications of the quantized eigenvalue equation in its various aspects. This lesson aims to enable the student to do this.	

1. Learning outcomes, teaching and learning methods and evaluation
A- Cognitive objectives
A1- Identify light, radiation, spectrum parameters, and the effect of matter on radiation, in addition to knowing the spectrum regions and explaining each region in detail.
A2- Link theoretical results to practical A3- Introduce the student to the scientific foundations of spectra and their importance in practical reality.
B- Course specific skill objectives B1- Providing the opportunity to discuss the topic with students by solving problems and creating a spirit of competition among Students Teaching and learning methods 1- Benefit from the textbook (Spectrum/Dr. Laila Mohamed Naguib). 2- Benefit from videos on the Internet about the subject of spectra as well as PowerPoint files. Microwave (Rotational(Spectroscop3- Prof. Tarek A. Fayed
Evaluation Methods
• Requesting solutions to some questions each semester.
• Student participation in the discussion and attendance through Google Forms
• Examining students electronically (directly through Google Forms)
C- Emotional and value-based objectives

C1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding students among them.
C2- Developing personal skills by giving poetry debates through their participation in central celebrations held within the university.
Teaching and learning methods
- Providing students with the basics and additional topics related to the outputs of thinking and analysis. Forming discussion groups during lectures to discuss chemistry topics that require thinking and analysis. Requesting solutions to a set of thinking questions during lectures Evaluation Methods • Requesting solutions to some questions each semester. • Student participation in the discussion and regular attendance via Google Forms Students' exam electronically (directly via Google Forms) D - General and transferable qualification skills (other skills related to employability and personal development). D1- Follow up on scientific development by contacting international universities via the Internet. D2- Participation in scientific conferences inside and outside the country. D3- Participation in scientific workshops and seminars inside and outside the country.

Course structure .1

Evaluation Method	Teaching Method	Unit/Course or Topic Name	Required learning outcomes	hours	Week
Monthly Exams	Paper and electronic lecture	Quantum Chemistry and Spectra (2) Fourth Stage	Chapter One Introduction to Spectrum	4	2-1
	Paper and electronic lecture	Quantum Chemistry and Spectra (2) Fourth Stage	Chapter Two Microwave Spectroscopy	6	3-5
	Paper and electronic lecture	Quantum Chemistry and Spectra (2) Fourth Stage	Chapter Three Infrared Spectrum	6	6-8
	Paper and electronic lecture	Quantum Chemistry and Spectra (2) Fourth Stage	Chapter 4 Raman Spectra	6	9-11
	Paper and electronic lecture	Quantum Chemistry and Spectra (2) Fourth Stage	Chapter Five Electronic Spectra	6	12-15

11. Infrastructure

- Required textbooks

- The methodological book (The Spectrum/ Dr. Laila Muhammad Najib).

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Microwave (Rotational(Spectroscop
Prof. Tarek A. Fayed

- Main references (sources)

- (Recommended books and references)
(scientific journals, reports, etc.)

Files explaining the subject in PDF and PPT format from the Internet.

- (Electronic reference, websites, ...)

12. Curriculum development plan
Updating the scientific material Using modern technologies

Course Description / Nano Chemistry 2

This is a complementary course for what students have taken last year, as such, its really about teaching the elements of nanochemistry which related to the nanotechnology.These elements will includes ;nano definitions, properties of nanomaterialis , nano materials classification,preparation methodologies ,and most important applications in addition to solar cells, nanofluids and smart materials principles.

University of Baghdad	1. Educational institution
Department of Chemistry / College of Science	2. Academic department/center
/ Nano Chemistry (2) / 462 ChNC	3. Course name/code
Weekly in-person	4. Available forms of attendance
Second course / 2023-2022	5. Semester/year
30 hours = 15 x 2 hours	6. Number of study hours (total)
01/9/2022	7. Date this description was prepared

Course objectives .1

This is a complementary course for what students have taken last year, as such, its really about teaching the elements of nanochemistry which related to the nanotechnology.These elements will includes ;nano definitions, properties of nanomaterialis , nano materials classification,preparation methodologies ,and most important applications in addition to solar cells, nanofluids and smart materials principles.

1. Course Outcomes, Teaching, Learning and Evaluation Methods
A- Cognitive Objectives
B- Course Skill Objectives
Teaching and Learning Methods
Evaluation Methods
C- Affective and Value Objectives
Teaching and Learning Methods: E-Learning:
D - General and transferable skills (other skills related to employability and personal development).

Course structure .2

Evaluation Method	Teaching Method	Unit name/topic	Required learning outcomes	hours	week
Monthly Exams	Paper and electronic lectures	Nano chemistry Review 1	Nano chemistry Review	2 hours	1
	Paper and electronic lectures	Nano chemistry Review 2	Nanochemistry Review	2 hours	2
	Paper and electronic lectures	Chemical functionalization of Carbon nanotube	Chemical functionalization of Carbon nanotube	2 hours	3
	Paper and electronic lectures	Chemistry of Quantum Dots	Chemistry of Quantum Dots	2 hours	4
	Paper and electronic lectures	The chemistry of Dendrimers	The chemistry of Dendrimers	2 hours	5

		Organic Nano polymers	Organic nanopolymers		
			First mid exam	2 hours	6
	Paper and electronic lectures	The rules of nanomaterials in Photovoltaic Solar Cell	The rules of nanomaterials in Photovoltaic Solar Cell	2 hours	7
	Paper and electronic lectures	The rules of nanomaterials in Photovoltaic Solar Cell	The rules of nanomaterials in Photovoltaic Solar Cell	2 hours	8
	Paper and electronic lectures	Smart materials and nanofluids	Smart materials and nanofluids	2 hours	9
	Paper and electronic lectures	Important Historical Events in Nanoscience	Important Historical Events in Nanoscience	2 hours	10
	Paper and electronic lectures	Important Historical Events in Nanoscience	Important Historical Events in Nanoscience	2 hours	11
			Second mid exam	2 hours	12
			Third mid exam	2 hours	13
			Course revision part 1	2 hours	14
			Course revision part 2	2 hours	15

1. Infrastructure

	• Required textbooks
	• Main references (sources)
1- Concept of nanochemistry By ;Ludovico Cademartiri and Geoffrey A. Ozin 2-Nanomaterials and Nanochemistry By; C. Br´echignac P. Houdy M. Lahmani 3-Nanoparticles From Theory to Application by :Gunter Schmid	• Recommended books and references (scientific journals, reports, ..
	• Electronic references, Internet sites

. Curriculum Development Plan3
Update 10% of the curriculum

Course Description / Instrumental Analysis 2

This course description provides an introduction to the mechanisms and devices for qualitative and quantitative analysis and how to deal with them, and an introduction to the types of techniques for separating and detecting various organic and inorganic compounds. The course also includes a full presentation of these techniques in terms of the mechanism of action, parts of the devices, and types of materials specialized in detecting them.

University of Baghdad / College of Science	1. Educational Institution
Department of Chemistry	2. University Department/Center
Instrumental Analysis (2) 457 ChIA	3. Course Name/Code
In-person	4. Available Attendance Forms
Second Semester / 2023-2022	5. Semester/Year

30 theoretical hours + 45 practical hours	6. Number of Study Hours (Total)
1-9-2022	7. Date this Description was Prepared

1. Course Objectives The objective of teaching the course of instrumental analysis for the fourth stage / second semester is to identify the mechanisms and devices for qualitative and quantitative analysis and how to deal with them and to identify the types of techniques for separating and detecting various organic and inorganic compounds. The course also includes a full presentation of these techniques in terms of the mechanism of work, parts of the devices and types of materials specialized in detecting them.

1. Learning outcomes, teaching and learning methods and assessment

A- Cognitive objectives

A1- Identify the various automated devices used in quantitative and descriptive analysis.
A2- Identify the automated electrical analysis and types of selective electrodes.
A3- Identify the methods of chromatography separation
A4- Identify the separation devices, especially gas chromatography and high-performance liquid chromatography
A5- Identify the methods of polarography
A6- Identify the methods of electrophoresis.
B- Course specific skill objectives
B1- Teaching the student how to use automated devices to examine and detect the concentrations and types of materials and compounds.
B2- Continuous discussion within the lecture and asking some external questions to expand the student's understanding of the material and the student's continuous participation in solving some mathematical and statistical problems.
B3- Teaching the student to benefit from the Internet to extract research and summary reports on the prescribed practical material

10- Teaching and learning methods

• Clarifying the scientific material through approved analytical books and creating paper and electronic lectures to clarify the mechanisms used under study.
• Creating an electronic class and a channel on the Telegram website.
• Proposed discussion within the lecture.
• Continuous use of the World Wide Web (Internet).

11- Evaluation methods

• Conducting short surprise exams every week so that the student is aware and continuously reading the topics of the curriculum.
• Conducting monthly exams and evaluating external reports and research required from the student.
• Conducting electronic news.

C- Emotional and value goals

C1- The ability to infer and suggest external questions and issues that expand the student's thinking.

D- General and transferable qualification skills (other skills related to employability and personal development).
D1- Conducting some scientific debates with other universities or well-known scientific centers and honoring the outstanding among them.
D2- Developing personal skills through scientific trips to sites specialized in chemical transactions.

Course Structure: Instrumental Analysis-2-Theoretical .1					
Evaluation Method	Teaching method	Unit/Course or Topic Name	Required learning outcomes	Hours	Week
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Strength Measurements and Guide Electrodes	**Mechanical Principles- Theoretical Basis And Applications Types of Guide Poles: Theoretical Basis- And Applications And Manufacturing And Mechanics Of Work**	2	1
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Reference Electrodes	**Types of reference poles: Theoretical basis and applications**	2	2
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Selective Electrodes	**Selective electrodes and their types in detail with the theoretical basis and applications and derivation of equations and calibrations of the**	2	3
Weekly Exams and Reports	1- Paper lectures 2- Electronic screen	Voltametric Measurements	**Voltametric:ا Theoretical basis Applications Mechanism Polarography:**	2	4

			Theoretical basis Applications Mechanism Calibrations Amperometric Applications		
الامتحانات والتقارير الاسبوعية	1- Paper lectures 2- Electronic screen	Electrical conductivity	**Conductivity measurement: Theoretical basis Applications and mechanism Conductivity calibrations Applications**	2	5
الامتحانات والتقارير الاسبوعية	1- Paper lectures 2- Electronic screen	Electrical methods	Amperometric calibrations and their types	2	6
الامتحانات والتقارير الاسبوعية	1- Paper lectures 2- Electronic screen	Electrodeposition	Deposition methods Electrical	2	7
			Exam	2	8
الامتحانات والتقارير الاسبوعية	1- Paper lectures 2- Electronic screen	Separation methods	**Chromatograph hy Its types - Its principles and laws - Its theories**	2	9
الامتحانات والتقارير الأسبوعية	1- Paper lectures 2- Electronic screen	Separation methods	**Gas chromatograph y, its types and types of columns used**	2	10
الامتحانات والتقارير الأسبوعية	1- Paper lectures 2- Electronic screen	Separation methods	**Detectors used in CG technology and applications**	2	11
الامتحانات والتقارير الأسبوعية	1- Paper lectures 2- Electronic screen	Separation methods	**High Performance Liquid Chromatograph y - Types of Columns**	2	12

الامتحانات والتقارير الأسبوعية	1- Paper lectures 2- Electronic screen	Separation methods	**Detectors used in CLPG technology and its applications**	2	13
الامتحانات والتقارير الأسبوعية	1- Paper lectures 2- Electronic screen	Separation methods	**Electrical deportation**	2	14
			الامتحان	2	الخامس عشر

Course Structure Analytical Chemistry Practical 2 .3					
Evaluation Method	Teaching method	Unit Name / Topic	Required Learning Outcomes	hours	Week
Quizzes and Report Evaluation Weekly	Paper notebook and electronic class	Finding the ionization constant of a weak acid through pH measurements	Learning about automated analysis methods through application on automated analysis devices	3	1
Quizzes and Report Evaluation Weekly	Paper notebook and electronic class	Conductivity correction of hydrochloric acid	Learning about automated analysis methods through application on automated analysis devices	3	2
Quizzes and Report Evaluation Weekly	Paper notebook and electronic class	Finding the pH of bromothymol blue indicator	Learning about automated analysis methods through application on automated analysis devices	3	3
Quizzes and Report Evaluation Weekly	Paper notebook and electronic class	Spectrometric determination of chromium hexahydrate	Learning about automated analysis methods through application on automated analysis devices	3	4
Quizzes and Report Evaluation Weekly	Paper notebook and electronic class	Spectrometric determination of paracetamol	Learning about automated analysis methods through application on automated analysis devices	3	5
Quizzes and Report Evaluation Weekly	Paper notebook and electronic class	Spectrometric determination of phosphate	Learning about automated analysis methods through application on automated analysis devices	3	6

Weekly quizzes and assessment reports	Paper notebook and electronic class	Spectrophotometric determination of chromates using standard addition method	Learning about automated analysis methods through application on automated analysis devices	3	7
Weekly quizzes and assessment reports	Paper notebook and electronic class	Determination of chloride ion using selective electrode	Learning about automated analysis methods through application on automated analysis devices	3	8

1. Infrastructure	
Fundamentals of analytical chemistry /Skoog and West ,7th ed.,2000 Fundamental of analytical chemistry by Skoog, West, Holler & Crouch, 8th , 2004.	• Required textbooks
Practical Instrumental Analysis: Methods, Quality Assurance, and Laboratory Management by Sergio Petrozzi Introduction to Instrumental Analysis by Robert D. Braun	• Main references (sources)

Scientific journals and research in the specialty	• Recommended books and references (scientific journals, reports, etc.)
Google website	• Electronic references, Internet sites

.12 Curriculum development plan

- Includes adding the latest automated methods for estimating elements and organic compounds

- Developing the curriculum content by deleting, adding and replacing

- Using modern teaching methods according to the nature of the subject

- Using modern assessment tools such as electronic assessment

- Creating an electronic class to communicate with students

Course Description / Biochemistry 4

This course description provides a clear understanding of the metabolism of fats, amino acids, and nitrogenous bases, the relationship of the mentioned terms to some diseases, and the mechanism of action of some drugs.

University of Baghdad / College of Science	1. Educational institution
Department of Chemistry	2. University department/center
Biochemistry (4) 458 ChBC	3. Course name/code
	4. Programs in which it is included
Weekly	5. Available forms of attendance
Second Semester / 2023-2022	6. Semester/year
30 hours = 15 x 2 hours	7. Number of study hours (total)
1/9/2022	8. Date this description was prepared

1. Course Objectives

The subject of Biochemistry (4) provides the fourth-stage chemistry student with scientific information and practical applications in clearly identifying the metabolism of fats, amino acids and nitrogenous bases and the relationship of the mentioned terms to some diseases and the mechanism of action of some drugs . Since humans derive their energy from food, which is converted into energy through the metabolism process, the subject of obesity and the nature of appropriate nutrition are clarified, which allows the student to have a basic understanding of the scientific principles related to the subject, and the compatibility of the practical aspect of the subject of Biochemistry (4) with the theoretical material, which facilitates understanding of scientific applications.

1. Learning outcomes and teaching, learning and assessment methods

A- Knowledge and understanding

A1- Introducing the student to the digestion, absorption, metabolism and synthesis of fats.
A2- Introducing the student to the digestion, absorption, metabolism and synthesis of amino acids.
A3- Introducing the student to the metabolism and synthesis of hemoglobin
A4- Introducing the student to the digestion, absorption, metabolism and synthesis of nitrogenous bases.

A5- Introducing the student to the diseases related to the metabolism of the above-mentioned biomolecules

B- Subject-specific skills

B1- Continuous discussion within the lecture (classroom and electronic) with the asking of questions to encourage the student's participation and expand his understanding of the scientific material.

B2- Teaching students to benefit from scientific references and the Internet unit and the importance of e-learning

Teaching and learning methods

1- Weekly practical exercises in the classroom and online.

2- Examples, questions and discussions.

3- Theoretical lectures, power point lectures and audio video lectures.

4- Teaching students to benefit from scientific references and the Internet unit.

Evaluation methods

1. Conducting oral exams during the lecture to encourage students to read the lectures daily.

2. Conducting short surprise exams to encourage students to read the lectures daily.

3. Assigning students daily homework.

4. Conducting continuous monthly exams.

C- Thinking skills

C1- Directing students to adhere to instructions inside the hall and daily attendance (in the classroom and online) in addition to university laws and regulations.

C2- Urging students to prepare lectures daily while using scientific references.

C3- Reminding students of the importance of studying and the scientific department they are studying.

C4- Trying to link the scientific material to students' practical life.

A5- Reminding students of the importance of e-learning.

Teaching and learning methods

- Viewing the results through websites and specialized books.
- Joint dialogue between students within groups.

Evaluation methods

- Homework submitted by students.
- Answering oral questions in the classroom.
- Weekly surprise and monthly exams distributed throughout the semester.

D- General and transferable skills (other skills related to employability and personal development).

D1- Conducting scientific debates and honoring outstanding students.

D2- Developing personal skills by giving poetry debates through students' participation in central celebrations

D3- Holding some courses and study circles in the department

D4- Holding scientific trips for students.

Course structure .1

Evaluation Method	**Teaching method**	**Name of Unit / Course or Topic**	Required learning outcomes	Hours	week
Weekly and Monthly Exams	Online lectures (Google Classroom) On Telegram channel	**Fat Metabolism: -Digestion and Absorption -Catabolism and Synthesis of Fatty Acids and Triglycerides -Beta-Oxidation Pathway**		4	1-2

		-Bioenergetics Calculations from the Oxidation of Saturated and Unsaturated Fatty Acids			
Weekly and Monthly Exams	Online lectures (Google Classroom) On Telegram channel	**-Cholesterol and ketone body breakdown and synthesis** **-Protein metabolism** هضم وامتصاص **Proteins**		4	3-4
Weekly and Monthly Exams	Online lectures (Google Classroom) On Telegram channel	**-Amino acid synthesis and metabolism, urea cycle, and diseases related to amino acid metabolism.**		4	5-6
Weekly and Monthly Exams	Online lectures (Google Classroom) On Telegram channel	**-Heme degradation and biosynthesis** **-Heme metabolism-related diseases**		4	7-8
			First monthly exam	2	9
Weekly and Monthly Exams	Online lectures (Google Classroom) On Telegram channel	- Metabolism of some non-protein nitrogen compounds -Nucleic acid metabolism A-Digestion and absorption		4	10-11
Weekly and Monthly Exams	Online lectures (Google Classroom) On Telegram channel	**- Purine and pyrimidine biosynthesis - rescue pathways, and diseases related to nitrogenous base metabolism**		4	12-13
Weekly and Monthly Exams	Online lectures (Google Classroom) On Telegram channel	**Biodegradation of purine and pyrimidine nucleotides**		2	14
			Second monthly exam	2	15

11. Infrastructure

-Nelson D.L. & Cox M.M., ***"Lehninger Principles of Biochemistry"***, 5th ed., W.H. Freeman and company, New York. 2008. - **Harvey R. A.** ***"Lippincott's Illustrated Reviews:Biochemistry"***, 5th Ed.Lippincott Williams &Wilkins.2011.	Required readings: Basic texts Course books Other

-Koolman J, K.H. Roehm Color Atlas of Biochemistry , 2nd edition. Thieme 2005 -Murray R.K., Granner D.K., Mayes P.A. & Rodwell V.W.: "***Harper's Illustrated Biochemistry***". 29th ed., Mc Graw-Hill Companies, New York. 2012. -Naik P. ***"Biochemistry"***, 2nd ..2007.	
Holding some student workshops in the department	Special requirements (including, for example, workshops, periodicals, software, and websites)
	Social services (including, for example, guest lectures, vocational training, and field studies)

.12Admission	
	Prerequisites
	Minimum number of students
	Maximum number of students

Course Description / Polymer 2

This course description provides the student with the mechanical and kinetic details of ionic, coordination, and ring-opening polymerization, in addition to studying the various physical and chemical properties of polymers and their effect on the uses of the polymer. It also studies polymer treatments based on different types of additives and studies their effect on the polymer specifications and thus its uses.

University of Baghdad / College of Science	1. Educational Institution
Department of Chemistry	2. University Department/Center
3. Course Name/Code Polymer459 ChPS -2-	3. Course Name/Code
Weekly in-person	4. Available Attendance Forms
Second semester / 2023-2022	5. Semester/Year
30 theoretical hours + 45 practical hours	6. Number of Study Hours (Total)

1/9/2022	7. Date this Description was Prepared

1. Course Objectives The objective of teaching Polymer 2 for the fourth stage/second semester is to introduce the student to the mechanical and kinetic details of ionic polymerization, coordination, ring opening, in addition to studying the various physical and chemical properties of polymers and their effect on the uses of the polymer. Also, studying polymer treatments based on different types of additives and studying their effect on the specifications of the polymer and thus its uses.

1. Learning outcomes, teaching and learning methods and assessment

A- Cognitive objectives

A1. Enabling students to gain knowledge of the treatments that can be introduced to polymers

A2. Enabling students to gain the highest knowledge of the types of additives and their impact on specifications and use

A3. Enabling students to gain knowledge of how to calculate molecular weight rates for polymers

A4. Enabling students to gain knowledge of the major role that polymer chemistry contributes to now and in the future

Teaching and learning methods

1. Guiding them to follow some topics through the information network.
2. Introducing some topics that require thinking and analysis
3. Assigning students homework

Evaluation methods

1. Evaluating the student through short exams.
2. Evaluating the student by assigning him to prepare reports through the information network.
3. Evaluating the student through monthly exams.
4. Evaluating the student through his regular attendance at electronic classes.

Polymer-2-Theoretical Course Structure .1

Evaluation Method	Teaching method	Unit Name / Course or Topic	Required Learning Outcomes	Hours	Week
Electronic Exams	Giving a lecture with examples and equations during the online class	Cationic Polymerization / Initiators / Mechanical and Kinetic	To learn about cationic polymerization	2	1
Electronic Exams	Giving a lecture with examples and equations during the online class	Anionic Polymerization / Mechanical and Kinetic Initiators	To learn about anionic polymerization	2	2
Electronic Exams	Giving a lecture with examples and equations during the online class	Coordination Polymerization / Initiators Basic Differences	To learn about coordination polymerization	2	3
Electronic Exams	Giving a lecture with examples and equations during the online class	Types of Polymer Isomers and Their Effect on Specifications	To learn about polymer isomers	2	4
Electronic Exams	Giving a lecture with examples and equations during the online class	Study and Mechanism of Lactone, Lactam and Cycloether Polymerization	To learn about ring-opening polymerization	2	5
Electronic Exams	Giving a lecture with examples and equations during the online class	Tylor Polymers Influencing Factors and Theories Glassy Polymers Influencing Factors and Theories	To learn about crystallization and the glassy state in polymers	2	6
Electronic Exams	Giving a lecture with examples and equations during the online class	Classification of Polymers According to Mechanical Properties as well as According to Stress and Strain Curves	To introduce the student to mechanical properties and stress-strain curves	2	7
Electronic Exams	Giving a lecture with examples and equations during the online class	Types of molecular weights, their calculation equations and methods of polymer fractionation	Identify molecular weights and polymer fractionation	2	8

Electronic Exams	Giving a lecture with examples and equations during the online class	Photo- and thermal-inhibitors and antioxidants	Introduce students to additives	2	9
Electronic Exams	Giving a lecture with examples and equations during the online class	Plasticizers and fillers and their effect on polymer properties, dyes and fire retardants	Introduce students to plasticizers, fillers and other additives	2	10

Course Structure Polymer-2- Practical

Evaluation Method	Teaching method	Name of the unit / course or topic	Required learning outcomes	hours	Week
Daily Quizzes with Reports	Paper lectures with a blackboard	Preparation of rayon	How to make artificial silk threads	4	First
Daily Quizzes with Reports	Paper lectures with a blackboard	Preparation of nitrocellulose	How to prepare nail polish and plastic sheet	4	Second
Daily Quizzes with Reports	Paper lectures with a blackboard	Preparation of Urea formaldehyde polymer	How to prepare UFR polymer which is used in the manufacture of plastics and others	4	Third
Daily Quizzes with Reports	Paper lectures with a blackboard	Preparation of Phenol formaldehyde polymer	How to prepare PFR polymer which is used in many industries	4	Fourth
Daily Quizzes with Reports	Paper lectures with a board	Preparation of starch and polystyrene adhesive and preparation of nylon 66	How to prepare adhesives of both types and nylon	4	Fifth
Daily Quizzes with Reports	Paper lectures with a board	Preparation of nitrocellulose	How to prepare plastic sheet	4	Sixth
Daily Quizzes with Reports	Paper lectures with a board	Preparation of nylon 66 and other types	How to prepare nylon of all kinds	4	Seventh

11.Infrastructure

Updated Macromolecular Chemistry / Written by Dr. Korkis Abdul Adam and Dr. Dhnoon Mohammed Aziz	1. Required textbooks
	2. Main references and sources
Polymer synthesis , theory and practice 4th edition , D.Braun, H.Cherdom, M.Rehahn(2005). Polymer chemistry by Seymow, carrahers5th edition	1(Recommended books and references)(scientific journals, reports..)
	2(Electronic reference, websites,...)

12. Curriculum development plan

Updating scientific material
Using modern technologies

Course Description / Petrochemicals 2

This course description provides an introduction to the most important industrial processes for the production of petrochemical materials and a study of their properties and most important uses. The course also aims to study the production processes of olefins, acetylenes, dienes and aromatic compounds and how to employ them in important petrochemical industries to produce intermediate materials and final industrial products.

1. Educational Institution	University of Baghdad / College of Science
2. University Department/Center	Department of Chemistry
3. Course Name/Code	Petrochemicals (2) 460 ChPT
4. Available Attendance Forms	Weekly in-person
5. Semester/Year	Second semester / 2023-2022
6. Number of Study Hours (Total)	30 theoretical hours + 45 practical hours
7. Date this Description was Prepared	1/9/2022

1. Course Objectives

Petrochemicals are chemical compounds composed mainly of crude oil and natural gas, and are used to manufacture a wide range of products such as detergents, fertilizers, medicines, adhesives, paints, plastics, synthetic fibers and other industries.

The aim of teaching Petrochemicals (2) for the fourth stage / second semester is to identify the most important industrial processes for the production of petrochemical materials and study their properties and most important uses.

The course also aims to study the production processes of olefins, acetylenes, dienes and aromatic compounds and how to employ them in important petrochemical industries to produce intermediate materials and final industrial products.

1. Learning outcomes, teaching and learning methods and assessment

A- Cognitive objectives

A1- Study chemical processes, reaction conditions and facilitating factors for the production of basic petrochemical materials in industry.

A2- Study chemical reactions of petrochemical materials and how to convert them into a final product.

A3- Identify the characteristics of the uses of petrochemical materials in industry.

B-Skill objectives for the course

- Training the student to write and discuss research and reports related to the production of petrochemical materials.
- Teaching by asking questions and finding appropriate solutions to industrial problems through discussion in the lecture.
- Expanding students' awareness of the interest in the national oil wealth and how to protect it.

Teaching and learning methods

- Explaining the scientific material using power point technology and educational videos.
- Presenting the scientific material in electronic classes in the form of educational videos and via the YouTube channel
- Using the World Wide Web (Internet) to follow up on developments in the petrochemical industry.
- Direct scientific lectures with students via Meet Google.

Evaluation Methods
- Periodic monthly exams.
- Evaluation of homework solutions.
- Evaluation of reports and research submitted by students.
- Evaluation of student performance and discussion and scientific questions in the electronic class.
C- Emotional and value-based objectives
C1- Guiding students to care about the national oil wealth.

C2- Listening to students, knowing their skills and developing them, and striving to solve their problems.

C3- Guiding students and urging them to study, excel, and challenge the obstacles they face.

C4- Health advice and guidance to maintain their safety and the safety of their families during the pandemic.

D- General and transferable rehabilitation skills (other skills related to employability and personal development).

D1- Discussions of students' research and reports and honoring outstanding students.

D2- Developing personal skills through their participation in scientific and artistic exhibitions and sports activities.

D3- Students' contribution to volunteer work and community service.

1. Course Structure Petrochemicals -2- Theoretical .1

Evaluation Method	Teaching Method	Name of unit/course or topic	Required learning outcomes	hours	Week
Evaluation of Homework Solutions	Video lectures Electronic	Chemicals Based on Ethylene	Study of petrochemical materials based on ethylene in their production	4	First and Second
Evaluation of Homework Solutions	Video lectures Electronic	Chemicals Based on Propylene	Chemical reactions for the production of various petrochemicals using propylene	2	Third
1. Evaluation of Homework Solutions	Video lectures Electronic	Chemicals Based on Butadiene	Study of methods and processes for the production and reactions of butadiene to produce various petrochemicals	4	Fourth and Fifth
		First exam		2	Sixth

Online exam	Video lectures Electronic	Acetylenes production& reactions	Production methods and processes Acetylene reactions to produce important petrochemicals	2	Seventh
1. Evaluation of homework solutions 2. Second review via Meet	Video lectures Electronic	Chemicals based on BTX	Methods and processes for the production of aromatic compounds	2	Eighth
Online exam	Video lectures Electronic	Chemicals based on BTX		4	Ninth and Tenth
		Second exam		2	Eleventh
Short exam	Video lectures Electronic	Chemicals based on acids	Petrochemicals based on acids	2	Twelfth
		Discussion of reports prepared by students		4	Third and Fourteenth

11. Infrastructure

• Required textbooks

The Petrochemicals, Hazim K. Yahya & Faaz A. Al-Kader.

• Main references (sources)

Chemistry of Petrochemical Processes, 2nd ed., Sami Matar & Lewis F. Hatch.

• (Recommended books and references) (scientific journals, reports..)

• (Electronic reference, websites,...)

12. Curriculum development plan
Updating scientific material Using modern technologies