

Republic of Iraq
Ministry of Higher Education & Scientific Research
Supervision and Scientific Evaluation Directorate
Quality Assurance and Academic Accreditation

Academic Program Specification Form For The Academic

University: *University of Anbar*

College: *College of Education for Pure Science*

Department: *Chemistry*

Date Of Form Completion : *10/6/2021*

Prof. Dr. Abdul Rahman
Salman. Juma

Assist. Prof. Dr. Harith Kamil
Buniya

Prof. Dr. Hameed Khaled
Jankeel

Dean's Name

Date: / /

Signature

Dean's Assistant
For Scientific
Affairs

Date: *10/6/2023*

Signature

Head of
Department

Date: *10/6/2023*

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Assist. Prof. Dr. Feras Shaker Mahmoud Batah

Quality Assurance And University Performance
Manager

Date: *10/6/2023*

Signature



TEMPLATE FOR PROGRAMME SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

PROGRAMME SPECIFICATION

This Programme Specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It is supported by a specification for each course that contributes to the programme.

1. Teaching Institution	University of Anbar
2. University Department/Centre	College of education for pure science- Department of Chemistry
3. Programme Title	Education Chemistry Sciences
4. Title of Final Award	Bachelor of Education Chemistry Sciences
5. Modes of Attendance offered	Quarterly
6. Accreditation	Nothing
7. Other external influences	School application - practical graduation research projects
8. Date of production/revision of this specification	2023/6/10
9. Aims of the Programme	
1. Achieving the specified standards for the quality of material, human, technical and financial resources.	
2. Providing an efficient administrative staff that knows its duties and powers according to the work structures and regulations, in which the requirements of the job description are fulfilled.	

3. Providing a specialized teaching staff who is fluent in using modern techniques and methods in education with good job satisfaction.

4. Preparing academic programs in accordance with international academic standards and providing their knowledge, training and technical requirements.

5. Preparing students with scientific, practical and educational knowledge that meets the needs of the labor market.

6. Paying attention to scientific research in terms of laboratory, research and researcher in order to achieve a distinguished research reputation locally and globally.

7. Research and professional openness to community institutions to meet their needs and aspirations.

8. Evaluate all individuals and processes to ensure quality performance and continuous improvement.

10. Learning Outcomes, Teaching, Learning and Assessment Methods

A1. Knowledge and Understanding

A1. Enable the student to acquire theoretical knowledge of chemistry.

A2. Empowering the student how to teach and ways of communicating scientific information to students.

A3. The student's knowledge of the methods of measurement and evaluation and methods of modern teaching methods in chemistry.

A4. The student is acquainted with the educational material by providing it electronically in the virtual classroom. In addition to enabling the student to know the learning theories related to the ages of students for the secondary school stage.

B. Subject-specific skills

B1. Gaining knowledge and enriching the student with the methods of laboratory work.

B2. Orienting the student to the scientific method in solving all scientific problems.

B3. Knowing the objectives and origins of the art of teaching chemistry.

B4. Enabling students to acquire the skills of using virtual classrooms

Teaching and Learning Methods

1. The method of listening and thinking deeply in order to understand the problem to solve it.

2. The method of scientific discussion and meaningful dialogue.

3. Adopting the method of monthly and final exams and submitting weekly reports.

Assessment methods

1. The treatment method using final scores.

2. Random and surprise tests.

3. Teaching tasks in the virtual classroom.

C. Thinking Skills

C1. Adopting the method of dialogue between the student and the professor.

C2. Interest in research projects and preparing organized reports

C3. Adopt the method of discussion. (Performance tests and seminars).

C4. Adopting e-learning to provide an interesting and flexible learning environment.

Teaching and Learning Methods

1. Method of application in research laboratories
2. Adopting the method of constructive dialogue and discussion
3. Adopt the trial-and-error method.
4. The adoption of multimedia in the virtual classes (image, text, audio, video)

Assessment methods

1. Preparation of the seminar (graduation research)
2. Adoption of the grading method as a basis in the evaluation process.
3. Adoption of the test method.
4. Adopting the method of discussions and dialogues between the students and the professor.
5. Create a test task in the virtual classes.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1- That the student benefit from his learning and embody this in his personal and professional development.

D2- That the student is able to employ the knowledge he receives during the study stage.

D3- That the student benefit from theoretical knowledge in employing the teaching profession and mastering it in a concept-based manner.

Fundamentals of teaching chemistry.

D4 - Skills of modern technologies in communication, documentation and communication.

Teaching and Learning Methods

1. Field visits in laboratories.
2. Scientific application in laboratories.
3. Take advantage of graduation research.
4. Presentation and presentation of educational content in virtual classes using multimedia (video, recorded lecture).

Assessment Methods

1. Articles and periodical research
2. The interview
3. Final exams
4. Determining study tasks and duties periodically and regularly in the virtual classroom

11. Programme Structure				
Level/ Year	Course or Module Code	Course or ModuleTitle	Weekly hours	
			Lec.	Lab.
First	CHEM111	Analytical Chemistry 1	2	2
	CHEM121	organic chemistry 1	2	2
	CHEM131	inorganic chemistry 1	2	0
	CHEM181	Chemical safety and security	2	-
	CHEM112	Analytical Chemistry 2	2	2
	CHEM122	organic chemistry 2	2	2
	CHEM132	inorganic chemistry 2	2	0
	BIO120	Biology	2	2
	EPS101	educational psychology	2	-
	EPS102	Education principles	2	-
	UOA140	English language 1	2	-
	UOA135	Human rights and democracy	2	-
	UOA137	Arabic language 1	2	-
	UOA141	Computer	1	2
	MAT105	Calculus 1	2	-
	MAT113	Calculus 2	2	-
Second	CHEM213	Analytical Chemistry 3	2	2
	CHEM223	Organic Chemistry 3	2	2
	CHEM233	Inorganic Chemistry 3	2	2
	CHEM241	Physical Chemistry 1	2	2
	CHEM214	Analytical Chemistry 4	2	2
	CHEM224	Organic Chemistry 4	2	2
	CHEM234	Inorganic Chemistry 4	2	2
	CHEM242	Physical Chemistry 2	2	2
	EPS202	Developmental Psychology	2	-
	EPS201	Educational Management	2	-
	EPS211	Scientific Research Methodolgy	2	-
	UOA240	Arabic Language 2	2	-
	UOA241	Computer	1	2
	MAT	Mathematics	2	-

Third	CHEM351	Biochemistry 1	2	2
	CHEM325	Organic Chemistry 5	2	2
	CHEM331	Inorganic Chemistry 5 (Coordination)	2	2
	CHEM341	Physical Chemistry 3	2	2
	CHEM361	Industrial Chemistry 1	2	-
	CHEM352	Biochemistry2	2	2
	CHEM326	Organic Chemistry 6	2	2
	CHEM332	Inorganic Chemistry 6 (Coordination)	2	2
	CHEM342	Physical Chemistry 4	2	2
	CHEM362	Industrial Chemistry 2	2	-
	EPS311	Curriculum and teaching method	2	-
	EPS312	Counseling and mental health	2	-
	UOA340	English Language 3	2	-
Fourth	CHEM453	Biochemistry 3	2	-
	CHEM427	Organic identification	2	2
	CHEM415	Instrumental Analysis 1	2	2
	CHEM445	Physical Chemistry (Quantum)	2	-
	CHEM463	Industrial Chemistry 3	2	2
	CHEM454	Biochemistry 4	2	-
	CHEM428	Organic identification 2	2	2
	CHEM416	Instrumental Analysis 2	2	2
	CHEM446	Physical Chemistry (Quantum)	2	-
	CHEM464	Industrial Chemistry 4	2	2
	EPS411	measuring and evaluating	2	-
	EPS412	teaching apps	2	-
	EPS413	school apps	-	4
CHEM491	Graduation Project	2	-	

13. Personal Development Planning

1. Using modern scientific sources.
2. Using rapid communication networks to transfer information such as the Internet.
3. Visits and practical practices in service laboratories.
4. Acquisition of scientific and modern experiences and skills in the field of modern technical communication

14. Admission criteria

1. Admission according to the general and central average system.
2. Admission to departments is according to the student's desire and is modified.
3. It is a condition for a graduate of the preparatory school and the scientific stream exclusively.
4. The accepted student's personal and mental integrity and freedom from physical impairments

15. Key sources of information about the programme

1. Curriculum books approved by the Sectorial Committee of the Faculties of Education for Pure Sciences.
2. Helping books.
3. Books and archaeological resources / sources in the English language.
4. Additional sources from the Internet.
5. The training courses held by the university on e-learning platforms.

Curriculum Skills Map																				
				Programme Learning Outcomes																
Year / Level	Course Code	Course Title	Core (C) or Option (O)	Knowledge and understanding				Subject-specific skills				Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	
First	CHEM111	Analytical Chemistry 1	core	√	√	√		√				√	√			√				
	CHEM121	organic chemistry 1	core	√	√	√		√				√	√			√				
	CHEM131	inorganic chemistry 1	core	√	√	√		√				√	√			√				
	CHEM181	Chemical safety and security	Option	√	√	√		√				√	√			√				
	CHEM112	Analytical Chemistry 2	core	√	√	√		√				√	√			√				
	CHEM122	organic chemistry 2	core	√	√	√		√				√	√			√				
	CHEM132	inorganic chemistry 2	core	√	√	√		√				√	√			√				
	BIO120	Biology	core		√	√		√					√			√			√	
	EPS101	educational psychology	core				√			√					√		√		√	
	EPS120	Education principles	core				√			√					√		√		√	
	UOA140	English language 1	core		√						√				√		√			
	UOA135	Human rights and democracy	core				√			√					√					
	UOA137	Arabic language 1	core				√				√				√					
	UOA141	Computer	core		√		√				√					√				√
	METH	Calculus 1	core		√	√			√									√		
METH	Calculus 2	core		√	√			√									√			

Curriculum Skills Map

				Programme Learning Outcomes																
Year / Level	Course Code	Course Title	Core (C) or Option (O)	Knowledge and understanding				Subject-specific skills				Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	
Second	CHEM213	Analytical Chemistry 3	core	√	√	√		√				√	√				√			
	CHEM223	Organic Chemistry 3	core	√	√	√		√				√	√				√			
	CHEM233	Inorganic Chemistry	core	√	√	√		√				√	√				√			
	CHEM241	Physical Chemistry 1	core	√	√	√		√				√	√				√			
	CHEM214	Analytical Chemistry 4	core	√	√	√		√				√	√				√			
	CHEM224	Organic Chemistry 4	core	√	√	√		√				√	√				√			
	CHEM234	Inorganic Chemistry 4	core	√	√	√		√				√	√				√			
	CHEM242	Physical Chemistry	core	√	√	√		√				√	√				√			
	EPS101	Developmental Psychology	core				√			√		√			√				√	
	EPS120	Educational Management	core				√			√					√	√	√	√		
	EPS211	Scientific Research Methodology	core				√						√		√		√			√
	UOA240	English Language 2	core						√		√				√	√				
	UOA241	Computer	core					√	√				√				√			

Curriculum Skills Map

please tick in the relevant boxes where individual Programmed Learning Outcomes are being assessed

				Programmed Learning Outcomes																
Year / Level	Course Code	CourseTitle	Core (C) or Option (O)	Knowledge and understanding				Subject-specific skills				Thinking Skills				General and TransferableSkills (or) Other skills relevant to employability and personal development				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	
Third	CHEM351	Biochemistry 1	core	√	√	√		√	√			√	√				√			
	CHEM325	Organic Chemistry 5	core	√	√	√		√	√			√	√				√			
	CHEM331	Inorganic Chemistry 5 (Coordination)	core	√	√	√		√	√			√	√				√			
	CHEM341	Physical Chemistry 3	core	√	√	√		√	√			√	√				√			
	CHEM361	Industrial Chemistry 1	core	√	√	√		√	√			√	√				√			
	CHEM352	Biochemistry2	core	√	√	√		√	√			√	√				√			
	CHEM326	Organic Chemistry 6	core	√	√	√		√	√			√	√				√			
	CHEM332	Inorganic Chemistry 6 (Coordination)	core	√	√	√		√	√			√	√				√			
	CHEM342	Physical Chemistry 4	core	√	√	√		√	√			√	√				√			
	CHEM362	Industrial Chemistry 2	core	√	√	√		√	√			√	√				√			
	EPS311	Curriculum and teaching methods	core				√			√	√			√	√	√	√	√	√	√
	EPS312	Counseling and mental health	core				√		√				√			√				
UOA340	English Language 3	core		√						√				√	√				√	

Curriculum Skills Map																			
				Programme Learning Outcomes															
Year / Level	Course Code	Course Title	Core (C) Or Option (O)	Knowledge and understanding				Subject-specific skills				Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
Fourth	CHEM453	Biochemistry 3	Core	√	√	√		√	√			√	√				√		
	CHEM427	Organic identification 1	Core	√	√	√		√	√			√	√				√		
	CHEM415	Instrumental Analysis 1	Core	√	√	√		√	√			√	√				√		√
	CHEM445	Physical Chemistry (Quantum)	Core	√	√	√		√	√			√	√				√	√	√
	CHEM463	Industrial Chemistry 3	Core	√	√	√		√	√			√	√				√	√	√
	CHEM454	Biochemistry 4	Core	√	√	√		√	√			√	√				√	√	√
	CHEM428	Organic identification 2	Core	√	√	√		√	√			√	√				√		
	CHEM416	Instrumental Analysis 2	Core	√	√	√		√	√			√	√				√		
	CHEM446	Physical Chemistry (Quantum)	Core	√	√	√		√	√			√	√				√		
	CHEM464	Industrial Chemistry 4	Core	√	√	√		√	√			√	√				√		
	UOA440	English language	Core		√	√											√		
	EPS411	measuring and evaluating	Core			√					√			√		√	√		
	EPS412	teaching apps	Core			√				√	√		√	√		√	√		
	EPS413	school apps	Core							√	√		√	√		√	√		
CHEM491	Graduation Project	Core					√			√		√			√	√			

Reviewing the performance of higher education institutions

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve. Demonstrating whether they have made the most of the learning opportunities available. It must be linked to a description the program.

1. Educational institution	College of Education for Pure Sciences / Anbar University
2. University department/center	Chemistry
3. Course name/code	Organic Chemistry / Third Stage Chem304/ Chem303,
4. The programs he participates in	Bachelor of Science in Chemistry
5. Available forms of attendance	Daily, at the time specified in the schedule, and at full time
6. Semester/year	Courses – first and second semester
7. Number of study hours (total)	2 hours
8. Date this description was prepared	2022-2023
9. Course objectives:	
10. Learning outcomes and methods of teaching, learning and evaluation	
a. Cognitive objectives	
1. Enable the student to obtain theoretical scientific knowledge of organic chemistry.	
2. Introducing the student to methods of preparing chemical compounds.	
3. The student's understanding of how chemical reactions occur through reaction mechanics.	
B. Course-specific skills objectives	
1. The student is proficient in conducting experiments and using equipment efficiently.	
2. The student must master the nomenclature of organic compounds.	
3. Distinguish between nucleophilic and electrophilic attack.	

4. Study the role of functional groups and their role in interaction.
Teaching and learning methods
1. Lectures
D - General and transferable skills (other skills related to employability and personal development.) 1. Adopting the method of dialogue between the student and the professor Preparing organized reports 2. Adopting the discussion method 3.

11. Course structure

The week	hours	Required learning outcomes	Name of the unit/course or subject	Teaching method	Evaluation method
1	2 theoretical 1 + 3 practical	Acids and bases	Acids and bases Factors affecting the origin of acidity and basicity	Lecture + laboratory	Weekly and monthly exams And laboratory reports
2	2 theoretical 1 + 3 practical	Carbonium ion	Effective organic intermediates Carbonium ion, methods of preparation, stability factors and interactions	Lecture + laboratory	Weekly and monthly exams
3	2 theoretical 1 + 3 practical	Carbanion	Carbanion ion, preparation	Lecture + laboratory	And laboratory reports

			methods, stabilization factors and interactions		
4	2 theoretical 1 + 3 practical	Carbene and nitrene	Carbene and nitrene Methods of their preparation, stability factors and interactions	Lecture + laboratory	Weekly and monthly exams
5	2 theoretical 1 + 3 practical	Free radical	Free radical Preparation methods, stability factors and interactions	Lecture + laboratory	And laboratory reports

11. Course structure					
6	2 theoretical + 3 practical	Benzyne	Benzyne intermediate Methods of its preparation and interactions	Lecture + laboratory	Weekly and monthly exams
7	2 theoretical + 3 practical	Stereochemistry	Stereochemistry Chiral carbon atom Naming spatial shapes according to the system (R, S)	Lecture + laboratory	And laboratory reports
8	2 theoretical	Reactions of chiral molecules	Interactions of	Lecture + laboratory	Weekly and

	+ 3 practical		chiral molecules		monthly exams
9	2 theoretical + 3 practical	Nucleophilic substitution on a saturated carbon atom	Nucleophilic substitution on a saturated carbon atom SN2, SN1 mechanics	Lecture + laboratory	And laboratory reports
10	2 theoretical + 3 practical	Nucleophilic substitution on a saturated carbon atom.	The effect of structure and solvent leaving group on the mechanism of SN2 and SN1	Lecture + laboratory	Weekly and monthly exams
11	2 theoretical + 3 practical	Elimination reactions	Elimination reactions are mechanical E2, E1 Orientation in E according to Saytsov and Hoffman	Lecture + laboratory	And laboratory reports

11. Course structure					
12	2 theoretical	Polycyclic aromatic	Polycyclic aromatic	Lecture + laboratory	Weekly and monthly

	+ 3 practical	compounds	compounds Name it		exams
13	2 theoretical + 3 practical	Polycyclic aromatic compounds	Polycyclic aromatic compounds Methods of obtaining them and their interactions	Lecture + laboratory	Weekly and monthly exams
14	2 theoretical + 3 practical	Heterocyclic compounds	Heterocyclic compounds Its types, names and physical properties	Lecture + laboratory	Weekly and monthly exams
15	2 theoretical + 3 practical	Heterocyclic compounds	Heterocyclic compounds Methods of obtaining them and their interactions	Lecture + laboratory	Weekly and monthly exams

12. Infrastructure			
: Required readings *Course books *Other	Graham Solomon	USA	Organic Chemistry
Special requirements	Jerry March	USA	Advanced Organic Chemistry
Social services (including, for example, guest lectures, vocational training, and field studies(If conditions exist, lecturers will be invited as guests

Prof. Dr. Abdallah hussien kshash

Course description form

Reviewing the performance of higher education institutions

(academic program review)

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve. Demonstrating whether they have made the most of the learning opportunities available. It must be

College of Education for Pure Sciences / Anbar University	Educational institution
Chemistry	University .2
Learning outcomes and methods of teaching, learning and evaluation .10	
<p style="text-align: right;">a. Cognitive objectives</p> <p>.1Enable the student to obtain scientific knowledge in diagnosing organic compounds. .2Introducing the student to spectroscopic methods for identifying organic compounds. Introducing the student to chemical methods in diagnosing organic compounds</p>	
<p style="text-align: right;">a. Course-specific skills objectives</p> <p>.1The student is proficient in conducting experiments and using equipment efficiently. .2The student must master chemical methods in diagnosing organic compounds. .3The possibility of diagnosing unknown organic compounds by chemical methods. The possibility of diagnosing unknown organic compounds using spectroscopic methods.</p>	
Teaching and learning methods	
<p style="text-align: right;">.1Lectures</p> <p>.2Using educational programs to give the lecture through one program and explain it to students through another program.</p>	
Evaluation methods	
<p>.1Oral exams (currently replaced by Quiz questions). .2Monthly exams. Quarterly exams.</p>	

C- Thinking skills

.1The student's ability to work within the educational and professional work team

.2Positive thinking and utilizing the knowledge you have received.

.3The ability to deal with parties outside the university and train with them.

That the student can learn and master the teaching profession.

Teaching and learning methods

.1Lectures
 .2Display slides
Use of laboratory materials and laboratory equipment

Evaluation methods

.1Oral exams
 .2Monthly exams
For quarterly exams

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

.1Adopting the method of dialogue between the student and the professor.

.2Preparing organized reports.
 Adopting the discussion method.

.11Course structure

Evaluation method	Teaching method	Name of the unit/course or subject	Required learning outcomes	hours	the week

<p>Weekly and monthly exams</p> <p>And laboratory reports</p>	<p>Lecture + laboratory</p>	<p>- the introduction</p> <p>- Mechanical absorption of infrared radiation</p> <p>Types of vibrations in organic molecules</p> <p>- Device parts</p> <p>- Sample preparation</p> <p>Important notes and rules about the IR spectrum and the factors affecting the location of the beams, including:</p> <p>(Aromatic compounds, aliphatic compounds, alkanes, alkenes, alkynes, alcohols and phenols, amines, ethers, carbonyl compounds, sulfonyl compounds, mercaptans, nitriles, aromatic systems)</p> <p>- Effective groups and their locations in the IR spectrum</p> <p>- Applications of IR in the diagnosis of organic compounds</p> <p>- Issues in IR spectrum</p>	<p>Infrared spectroscopy (I.R)</p>	<p>2theoretical + 3 practical</p>	<p>5 - 1</p>
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.11 Course structure (continuation)

Evaluation method	Teaching method	Name of the unit/course or subject	Required learning outcomes	hours	the week
Weekly and monthly exams And laboratory reports	Lecture + laboratory	<p>1-1H-NMR</p> <ul style="list-style-type: none"> - the introduction - Device parts - Sample preparation <p>How does nuclear resonance occur?</p> <ul style="list-style-type: none"> - Blocking and non-blocking - Chemical displacement - Measurements of the signal location in the 1H-NMR spectrum - Important notes on 1H-NMR spectroscopy - Benefits and conclusions from signals in the 1H-NMR spectrum - Splitting of resonance signals and its causes - Aromatic systems - Chemical displacement locations of protons in the 1H-NMR spectrum - Applications of (1H-NMR) in the diagnosis of organic compounds 	Nuclear magnetic resonance (NMR) spectroscopy	2theoretical + 3 practical	10 - 6

- Issues in ¹H-NMR spectrum

.11 Course structure (continuation)

طريقة التقييم	طريقة التعليم	اسم الوحدة / المساق أو الموضوع	مخرجات التعلم المطلوبة	الساعات	الأسبوع
Weekly and monthly exams And laboratory reports	Lecture + laboratory	C-NMR ¹³ – 2 the introduction - Important notes in the ¹³ C- - NMR spectrum Chemical displacement sites - of some ¹³ C atoms Examples of ¹³ C-NMR - spectrum Issues in ¹³ C-NMR - spectrum	Nuclear magnetic resonance (NMR) spectroscopy	2theoretical + 3 practical	11
Weekly and monthly exams And laboratory reports	Lecture + laboratory	- the introduction - Benefits and conclusions of using the UV spectrum in diagnosing organic compounds - Device parts - Mechanism of absorption of ultraviolet radiation by organic molecules - Important terms in the UV spectrum - Factors affecting the positions of the beams in the ultraviolet spectrum (oxochrome, hydrogen bonding, sequence, steric obstruction) - Benzene, its derivatives, and other aromatic compounds - Interpretation of ultraviolet spectra.	Ultraviolet spectroscopy (UV)	2theoretical + 3 practical	13 - 12
Weekly and monthly exams And laboratory	Lecture + laboratory	- the introduction - Device parts - Initialize the form	Mass spectrometry (MS)	2theoretical + 3 practical	15 - 14

Infrastructure.11	
<p>1 – Spectrometric Identification Of Organic Compounds , Seventh Edition ,Robert M. Silverstein , New York , 2005</p> <p>2 - Organic Chemistry ,Third Edition , Janice Gorzynski Smith , New York , 2011</p>	<p>Required readings: <input type="checkbox"/> Course books Other</p>

reports		<ul style="list-style-type: none"> - Conclusions from the mass spectrum - The general shape of the mass spectrum - Applications and examples of mass spectrum in diagnosing organic compounds * Issues in the spectroscopic diagnosis of organic compounds 			
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Absorption spectra of organic molecules, translated by: Prof. Dr. Abdul Hussein Khudair Abbas Al Sharba, Jassim Muhammad Ali Al-Rawi, Muhammad Ahmed Al-Iraqi, University of Mosul, 1985.	Special requirements
If conditions exist, guest lecturers will be invited.	Social services (including, for example, guest lectures, vocational training, and field studies)

admissions .12	
Completing the course means that the student must obtain a passing grade	Prerequisites
25students	The smallest number of students
120students	The largest number of students

Dr. Ali Sami

Course description form

Reviewing the performance of higher education institutions

(academic program review)

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve. Demonstrating whether they have made the most of the learning opportunities available. It must be linked to a description the program.

Anbar University/ College of Educational Sciences for Pure Sciences	Educational institution .13
chemistry department	University department/center .14

Industrial Chemistry practical / CHEM 361	Course name/code .15
	Programs in which it is .16 included
Attendance and on time	Available attendance forms .17
Chapter one/academic year Fourth	Semester/year .18
6	Number of study hours (total) .19
2022-2023	Date this description was .20 prepared
Course objectives: .21	
Preparation A generation of students with knowledgeable qualifications in chemistry.	
Preparation Teachers with advanced knowledge of chemistry and its sections and branches.	
Development Skills for students through practical training -	
Expand Students' scientific knowledge and enriching them with modern theoretical information	
10- Learning outcomes and methods of teaching, learning and evaluation	
Cognitive objectives -a	
Enabling the student to obtain theoretical knowledge of chemistry ❖	
Empowering students in teaching methods and methods of delivering scientific information to students ❖	
The student's knowledge of measurement and evaluation methods and modern teaching methods in chemistry ❖	
Course-specific skills objectives -b	
Directing the student towards the scientific method in solving all scientific problems ❖	
Knowing the goals and principles of the art of teaching chemistry ❖	
Enabling students to acquire skills in using virtual classrooms ❖	
Teaching and learning methods -c	
A method of listening and thinking deeply in order to understand the problem to solve it ❖	
The method of scientific discussion and purposeful dialogue ❖	
Evaluation methods -d	
Participation in the classroom ❖	
Provide activities ❖	
Adopting the method of daily examinations and submitting weekly reports and ❖	

Course structure .11					
Evaluation method	Teaching method	Name of the unit/course or subject	Required learning outcomes	hours	the week
General questions and discussion	practical	Preparation of phthalic alkyd resin	Introducing students to chemistry Industrial and polymers	6	the first
General questions and discussion or exam	practical	Preparation of cellulose acetate	ProcedureAn experiment related to the preparation of a type of polymer	6	the second
General questions and discussion or exam	practical	Labels	ProcedureAn experiment related to the preparation of a class of industrially important polymers	6	the third
General questions and discussion or exam	practical	Determination of the molecular weight of the polymer from intrinsic viscosity measurements	ProcedureAn experiment related to determining polymer specifications	6	the fourth
General questions, discussion or exam	practical	Determine the amount of fatty acids in soap	ProcedureAn experience related to identifying the quality of an industrial product	6	Fifth
General questions, discussion or exam	practical	Preparation of indigo tincture	ProcedureAn experiment related to the preparation of a commercial industrial compound	6	VI

monthly and final examinations

Practical industrial chemistry written by Dr. Salwa Abdel Qader	Required readings: Course books •
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admissions .13	
Nothing	Prerequisites
15	The smallest number of students
25	The largest number of students

Zeyad Khudhur Abdullrazzaq

Course description form

Reviewing the performance of higher education institutions

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve. Demonstrating whether they have made the most of the learning opportunities available. It must be linked to a description of the program.

College of Education for Pure Sciences /	.1Educational institutio
Anbar University	University
Chemistry	.2department/center
Pollution EC 3302	.3Course name/code
Bachelor of Science in Chemistry	.4The programs he participates in
Daily, at the time specified in the schedule, and at full time	.5Available forms of attendance
Semester (second semester)	.6Semester/year
2 hours	.7Number of study hours (total)

2020 / 2021	Date this description was. 8 prepared
22. Course objectives:	
<p>1- Introducing the student to the concept of the environment in its broad sense, knowing the ecosystem and the importance of balance in it, learning about the concept of pollution, as well as knowing the layers of the atmosphere and learning about the basic components of the air.</p> <p>2- Identify the sources of air pollution, gaseous air pollutants, and knowledge of the ozone layer.</p> <p>3- Identify the preventive methods necessary to control air pollution.</p> <p>4- Identify the sources of water pollution and know the stages of wastewater treatment</p> <p>5- Identify the sources of soil pollution and how to treat them</p> <p>6- Knowledge of noise pollution, pollution, sources of radioactive pollution, and how to prevent and treat them.</p>	
23. Learning outcomes and methods of teaching, learning and evaluation	
a. Cognitive objectives	
<p>.1Enabling the student to obtain theoretical scientific knowledge of environmental pollution and how to treat it.</p> <p>.2Introducing the student to methods of preventing contamination of living organisms.</p>	
a. Course-specific skills objectives	
<p>1. The student will master the knowledge of the effects of pollution on living organisms and how to avoid them.</p> <p>2. The student must master how to use proper methods to avoid contamination</p>	
Teaching and learning methods	
1. Lectures	
Using educational programs to give the lecture through one program and explain it to students through another program.	
Evaluation methods	
<p>1. Oral exams (currently replaced by Quiz questions).</p> <p>2. Monthly exams.</p> <p>Quarterly exams.</p>	
C- Thinking skills	
<p>.1The student's ability to work within the educational and professional work team</p> <p>.2Positive thinking and utilizing the knowledge you have received.</p> <p>.3The ability to deal with parties outside the university and train with them on eliminating air pollution.</p>	
That the student can learn and master the teaching profession	
Teaching and learning methods	

.1 Lectures .2 Display slides .3 Use laboratory materials
Evaluation methods
1. Oral exams 2. Monthly exams 3. For quarterly exams
D - General and transferable skills (other skills related to employability and personal development). 1. Adopting the method of dialogue between the student and the professor. 2. Preparing organized reports. Adopting the discussion method.

11. Course structure					
Evaluation method	Teaching method	Name of the unit/course or subject	Required learning	hours	the week
Weekly and monthly exams And reports	lecture	Identify the concept of the environment, its balance, pollution and its classifications	outcomes	2 Theoretical	1
Weekly and monthly exams And reports	lecture	Layers of atmospheric feed, its most important external components, and classification of existing gases	the environment	2 Theoretical	3
Weekly and monthly exams And reports	lecture	Gaseous air pollutants, physical pollutants and secondary pollutants Factors affecting the density of atmospheric	Atmosphere Air	2 Theoretical	4
Weekly and monthly exams And reports	lecture	pollutants and the effect of these pollutants on temperature	pollutants Air	2 Theoretical	5
Weekly and monthly exams And reports	lecture	Methods and treatments for controlling atmospheric air pollutants	pollutants Control of air pollutants	2 Theoretical	6
Weekly and monthly exams And reports	lecture	Water pollutants and methods of treating water pollution	Water Pollution	2 Theoretical	7
Weekly and	lecture	Soil pollutants and methods of	Methods of	2	8

Establishing an integrated laboratory for the environment and pollution	Special requirements Social services (including, for example, guest lectures, vocational training, and field studies)
If conditions exist, guest lecturers will be invited.	

monthly exams And reports		controlling and treating soil	treating soil pollutants Noise	Theoretical	
Weekly and monthly exams And reports	lecture	pollution Identify noise pollution, its effects, and ways to control it	Pollution Radioactive pollution	2 Theoretical	9
Weekly and monthly exams And reports	lecture	Identify radioactive contamination, its sources, effects, and methods of controlling it		2 Theoretical	10

Acceptance	
Completing the course means that the student must obtain a passing grade	Prerequisites
50 students	The smallest number of students
170 students	The largest number of students

Dr.muthana mohammed sarhan

Course description form

Reviewing the performance of higher education institutions

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve.

Educational institution .1	College of Education for Pure Sciences / Anbar University
Learning outcomes and methodologies of instruction, assessment, and learning .10	
<p style="text-align: right;">Cognitive objectives: .A</p> <ol style="list-style-type: none"> 1. Enabling the student to know the English language and its grammar 2. Teach the student how to write and read in a simple way in English 3. Improving knowledge of how to pronounce words and their pronunciations 	
<p style="text-align: right;">Course-specific skills objectives: .B</p> <ol style="list-style-type: none"> 1. The student masters how to use English grammar according to the required tenses 2. The student must master how to read in English and understand and translate some important words 3. Distinguishing between the use of tenses as required due to similarities in the solution 4. Knowledge of many important vocabularies, especially with regard to specialization 	
Teaching and learning methods	
<ol style="list-style-type: none"> 1. Lectures 2. Using educational programs to give the lecture through one program and explain it to students through another program. 	
Evaluation methods	
<ol style="list-style-type: none"> 1. Oral exams (currently replaced by Quiz questions). 2. Monthly exams. 3. Semester exams. 	

C- Thinking skills	
<ol style="list-style-type: none"> 1. The student's ability to work within the educational and professional work team 2. Positive thinking and utilizing the knowledge you have received. 3. The ability to deal with parties outside the university and train with them. 4. That the student is able to learn and master the teaching profession and how to deal with it 	
Teaching and learning methods	
<p style="text-align: right;">Lectures .1</p> <p>The curriculum is customized according to the stage (Beginner Student's Book) .2</p> <p style="text-align: right;">Use a Workbook with key .3</p>	
Evaluation methods	
<ol style="list-style-type: none"> 1. Oral exams 2. Monthly exams 3. For semester exams 	
D - General and transferable skills (other skills related to employability and personal development).	
<ol style="list-style-type: none"> 1. Adopting the method of dialogue between the student and the teacher. 2. Ask questions during the lecture. 3. Adopting the discussion method. 	

Course plan .11

Week	hours	Required learning outcomes	Name of the unit/course or subject	Teaching method	Evaluation method
1	2	Hello!	Am/ are/is/my/you. What's this in English? Number 1-10. Plurals	lectures	Quiz and exam
2	2	Your World	Countries / he/ she/they/his/her/. Where's he from?	lectures	Quiz and exam
3	2	All about you	Jobs. Negatives and questions. Personal information. Social expressions (1)	lectures	Quiz and exam
4	2	Family and friends	Our/ their. Possessive's. The family. Has/have. The alphabet.	lectures	Quiz and exam
5	2	The way I live	Sport/food/ drinks. Present	lectures	Quiz and

			simple- I /you/we/they. (a/an) languages and nationalities		exam
6	2	Every day	The time / present simple- he/she/ always/ sometimes/never. Words that go together.	lectures	Quiz and exam
7	2	My favorites	Questions words / me/him/us/ them / this / that. Adjectives. Can I	lectures	Quiz and exam
8	2	Where I live	Room and furniture. There is/are. prepositions. directions	lectures	Quiz and exam
9	2	Times past	Saying year / was/were born / past simple – irregular verbs / have/do/go	lectures	Quiz and exam
10	2	We had a great time!	Past simple- regular verbs. Questions and negatives. Sport and leisure.	lectures	Quiz and exam
11	2	I can do that	Can/can't. adverb. adjective+ noun. Everyday problems	lectures	Quiz and exam
12	2	Please and thank you	I'd like some/any. In a restaurant. Sings all around	lectures	Quiz and exam
13	2	Here and now	Colours and clothes. Present continuous. Opposite verbs	lectures	Quiz and exam
14	2	It's time to go	Future plans. Grammar revision vocabulary revision	lectures	Quiz and exam
15	2	Past, present, and future	Education, work, and ambitions. Reading and speaking	lectures	Quiz and exam
16	2	Grammar revision	Tenses. Social expressions (2)	lectures	Quiz and

					exam
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Required readings: .1 Coursebook.2 Other.3	Beginner Student's Book New Headway Plus (John and Liz Soars) Oxford Beginner Workbook with key
Special requirements	Grammar in use with answer
Social services (including, for example, guest lectures, vocational training, and field studies)	If conditions exist, guest lecturers will be invited.

12. Admissions	
Prerequisites	To successfully complete the course, the student must get a grade that meets the prerequisite requirements.
The fewest number of students	45 Students
The largest number of students	150 students

Dr. Hamied Khalid Ali

Course description form

**Reviewing the performance of higher education institutions
 (academic program review)**

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve. Demonstrating whether they have made the most of the learning opportunities available. It must be

1. Educational institution	College of Education for Pure Sciences
2. University department/center	chemistry department
3. Course name/code	Physical Chemistry (Quantum and Spectroscopy) / Fourth
9-Learning outcomes and methods of teaching, learning and evaluation	
<p style="text-align: center;">Cognitive objectives</p> <p>1. The student's knowledge of the concepts of ancient quantum theory.</p> <p>2. The student's knowledge of the basic concepts and principles of modern quantum theory (wave mechanics).</p> <p>3. Knowledge of the quantitative model of atomic structure.</p>	
<p>Course-specific skills objectives</p> <p>.1The student will master the use of wave and matrix quantization methods to obtain the energy levels and wave functions of the system.</p> <p>.2Quantitative processing of spectral data.</p> <p>.3Quantitative interpretation of the structure and stability of matter.</p>	
-Teaching and learning methods10	
1. Lectures	
2. Using educational programs to give the lecture through one program and explain it to students through another program.	
3-Evaluation methods	

Emotional and value goals 1. Adopting the method of dialogue between the student and the professor. 2. Preparing organized reports. 3. Adopting the method of discussion. 4. Interest in research projects.
Teaching and learning methods
1. Lectures 2. Display slides - smart board 3. Use laboratory materials and measuring devices
Evaluation methods
1. Oral exams. 2. Monthly exams 3. For quarterly exams
General and transferable skills (other skills related to employability and personal development). 1. The student's ability to work within the educational and professional work team. 2. Positive thinking and utilizing the knowledge you have received. 3. The ability to deal with parties outside the university and train with them. 4. That the student is able to learn and master the teaching profession

11. Course structure

Evaluation method	Teaching method	Name of unit/course or subject	Required learning outcomes	Hours	Week
Monthly exams	lecture	Ancient quantum theory	Ancient quantum theory	4 Theoretical	1

Monthly exams	lecture	Introduction	Mathematical introduction	4 Theoretical	2
Monthly exams	lecture	Introduction	Classic mechanics	4 Theoretical	3
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Wave equation (time-independent Schrödinger equation)	4 Theoretical	4
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Quantum mechanical hypotheses (wave function)	4 Theoretical	5
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Influences	4 Theoretical	6
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Eigenvalue equation	4 Theoretical	7
Monthly exams	lecture	Basic hypotheses of quantum mechanics	The time-independent Schrödinger equation	4 Theoretical	8
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Dirac representation of quantum mechanics	4 Theoretical	9
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Particle system in a box	4 Theoretical	10
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Quantum tunneling effect	4 Theoretical	11
Monthly exams	lecture	Basic hypotheses of quantum mechanics	The waveform of a harmonic oscillator	4 Theoretical	12
Monthly exams	lecture	Basic hypotheses of quantum mechanics	Matrix formula for harmonic oscillator	4 Theoretical	13

12-Infrastructure	
<p>Salem Muhammad Khalil, Principles of Quantum Chemistry, University of Mosul 1982. Qais Abdul Karim, Quantum Chemistry and Molecular Spectroscopy, University of Basra, 1988. Nouri Al-Mashhadani, Physical Chemistry, University of Baghdad 1988.</p>	1- Required prescribed books
quantum mechanics	2- Main references (sources)

Monthly exams	lecture	Basic hypotheses of quantum mechanics	Hard rotor	4 Theoretical	14
Monthly exams	lecture	Basic hypotheses of	Complete solution of the hydrogen atom	4 Theoretical	15

<p>I. Levine, Quantum Chemistry , 5th edition, Prentic Hall 2000 Y. Peleg, Schaum outline of Quantum Mechanics, Mechanics, McGraw Hill 1977. D. Rogers, Concise Physical Chemistry, Wiley 2011.</p>	<p>A- Recommended books and references (scientific journals, reports,...)</p>
<p>R. Blumel, Foundation of Quantum Mechanics from Photons to Quantum Computers, Jaus & Bartett 2011. R. Prasad, Quantum Chemistry, 3rd edition, New Age Ltd. Publishers, New Delhi 2007</p>	<p>B - Electronic references, Internet sites.</p>

Dr. Bashar Abdulazeez Mahmood

Course description form

Reviewing the performance of higher education institutions (academic program review)

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve. Demonstrating whether they have made the most of the learning opportunities available. It must be linked to a description the program.

for

	Pure Sciences
2-University department or center	Chemistry department
3-Course Name	Analytical Chemistry, The first stage CHEM111
4-Available attendance forms	Daily and on time
5-Season of the year	First semester
6-Number of study hours	44hours
7-Date this description was prepared	2022-2023

8-Course objectives: Knowing chemistry as a knowledge science and getting to know its specializations, especially chemical analysis in action, especially in preparing the required amount of material. Knowing and studying ways to express different types of discrimination and studying descriptive analysis methods

1- Course outcomes and teaching, learning and evaluation methods
<i>A- Cognitive objectives</i>
1- Introducing the student to methods of laboratory detection of substances 2- Enable the student to obtain scientific knowledge in analytical chemistry
<i>B - Course-specific skills.</i>
1-The student must be proficient in conducting practical experiments and using devices efficiently. 2-To master the methods of detecting the required chemical compounds
Teaching and learning methods
1-Conduct laboratory experiments 2-Using educational programs to give the lecture through one program and explain it to students through another program
Evaluation methods
1- Oral exams (currently replaced by Quiz questions) 2-Monthly exams.
3- Quarterly exams.
<i>C- Educational and evaluation objectives</i>
The student's ability to work within the educational work team. Thinking in a way that leads to the student acquiring knowledge. The ability to deal with outside the university and facilitate this. The student must learn and master the teaching profession.
Teaching and learning methods
1-Laboratory experiments 2-Slide show 3- Use laboratory materials
Evaluation methods
1- Oral exams ... 2-monthly exams 3-For quarterly exams

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

- 1-Relying on the method of dialogue between the student and the professor.
- 2-Record organized reports.
- 3-Relying on discussion

9-Course structure					
The week	The number of the hours	Required learning outcomes	Subject name	Teaching method	Evaluation methods
1	2 hours	Learn about analytical chemistry and its branches	Initial laboratory information The general outline of the descriptive analysis	Laboratory	Oral exams monthly exams For quarterly exams
2	2 hours	Positive ion analysis	The first group	Laboratory	Oral exams monthly exams For quarterly exams
		Positive ion analysis	The second group		Oral exams monthly exams

11-Course development plan

If conditions exist, guest lecturers will be invited for the purpose of vocational training and field studies

10-Infrastructure

1-Required prescribed books		analysis	9th	Analytical Chemistry -Fundamentals of Analytical Chemistry- Douglas A. Skoog- 8 edition - USA	
2- Main references	5	Positive ion analysis	Fourth	Analytical Chemistry” by Gary D. Christian, Purnendu K. (Sandy) Dasgupta, Kevin A. Schug, 7th Edition, 2014.	
3- Recommended books and references (scientific journals, reports,...)	6	Positive ion analysis	Fifth group	Laboratory	Analytical Chemistry -Fundamentals of Analytical
4- Electronic references, Internet sites					Practical experiments on the Internet

Dr. Ahmed dhary saleh

Course description form

Reviewing the performance of higher education institutions

(academic program review)

This course description provides a succinct summary of the most important course characteristics and the learning outcomes the student is expected to achieve. Demonstrating whether they have made the most of the learning opportunities available. It must be linked to a description the program

1. Educational institution	College of Education for Pure Sciences / Anbar University
2. University department/center	Chemistry
3. Course name/code	Instrumental Analysis / Forth Stage chem415,
4. The programs he participates in	Bachelor of Science in Chemistry
5. Available forms of attendance	Daily, at the time specified in the schedule, and at full time
6. Semester/year	Courses – first second semester
7. Number of study hours (total)	4 Theoretical + 3 Practical
8. Date this description was prepared	2020-2021
9. Course objectives:	
This course aims to teach the student what is the meaning of automated analysis, what are its advantages, what are the most important techniques of automated analysis, and to know the components of all the devices of these techniques and how to use them in quantitative and qualitative analysis.	

10. Learning outcomes and methods of teaching, learning and evaluation
a. Cognitive objectives

1. Enabling the student to obtain theoretical scientific knowledge of automated analysis.
2. Introducing the student to methods of automated analysis.
3. The student's understanding of how to use these techniques and their applications in different areas of life with regard to quantitative and qualitative analysis
B. Course-specific skills objectives
1. The student is proficient in conducting experiments using different techniques.
2. Enable the student to work on different devices
3. Training the student to calculate or estimate an unknown using various automated analysis techniques
Teaching and learning methods
1. Lectures
D - General and transferable skills (other skills related to employability and personal development.)
1. Adopting the method of dialogue between the student and the professor. 2-Preparing organized reports 3-Adopting the discussion method

11. Course structure

The week	Hours	Required learning outcomes	Name of the unit/course or subject	Teaching method	Evaluation method
1	4 theoretical + 3 practical	Analytical chemistry and the concept of instrumental chemical analysis	Analytical chemistry is the science concerned with diagnosing the identity and composition of substances and determining their proportions.	Lecture + laboratory	Weekly and monthly exams And laboratory reports
2	4 theoretical + 3 practical	The photoelectric effect and the electromagnetic spectrum	What is meant by this phenomenon is the release or	Lecture + laboratory	Weekly and monthly exams

			<p>emission of electrons from the surfaces of some sensitive metals when radiation with sufficient energy falls to release them. Such as the release of electrons from the surfaces of some metals when radiation from the visible or violet region falls on them, while the electromagnetic spectrum can be divided into multiple regions according to the energy released</p>		
3	4 theoretical + 3 practical	Polarization of light and optical efficiency	<p>Polarization is of great importance in chemistry, as some crystals and liquids that do not have a center of symmetry (asymmetric) can rotate the plane of the polarized light that passes through them, as it undergoes rotation, either to the right (clockwise), which is called right (+ Dextrorotatory),</p>	Lecture + laboratory	And laboratory reports

			<p>or to the left, which is called Levorotatory, - This phenomenon is known as the optical activity of the material</p>		
4	4 theoretical + 3 practical	Radiation absorption and radiation emission	<p>Absorption means the disappearance of a portion of the wave frequencies when it passes through a medium (gas, liquid, solid.)</p>	Lecture + laboratory	Weekly and monthly exams
5	4 theoretical + 3 practical	Quantitative analysis by absorption of electromagnetic radiation	<p>If a radiation beam is passed through a glass container containing a solution, the light beam emerging from the container will be less than the power of the original incident beam.</p>	Lecture + laboratory	And laboratory reports

11. Course structure

6	4 theoretical + 3 practical	Applications of Beer's law to multicomponent systems	<p>When a solution contains more than one substance that has the ability to absorb the beam. What the solution absorbs is the</p>	Lecture + laboratory	Weekly and monthly exams
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			product of the sum of the absorption of the individual materials at a specific wavelength.		
7	4 theoretical + 3 practical	Spectrophotometers and their components	The spectrophotometer consists of five basic components: a radiation source, a cell color combiner for setting the model, a detector, and a recorder	Lecture + laboratory	And laboratory reports
8	4 theoretical + 3 practical	Applications of absorption measurements in spectroscopy in the ultraviolet and visible regions	The ultraviolet and visible regions constitute a very small area of the electromagnetic spectrum, in the range (10-780 nm). The radiation energy of these two regions has the ability to excite valence electrons in atoms or molecules, so the two regions are studied together under the name ultraviolet and visible	Lecture + laboratory	Weekly and monthly exams
9	4 theoretical + 3 practical	Analytical uses of absorption measurements	It has little importance for the purposes of qualitative but important in	Lecture + laboratory	And laboratory reports

			Quantitative analysis		
10	4 theoretical + 3 practical	Analysis by measuring scattering and measuring turbidity	Scattering and turbidity measurements are used to study and analyze plankton systems. These two methods are based on the scattering and scattering of radiation by suspended particles,	Lecture + laboratory	Weekly and monthly exams
11	4 theoretical + 3 practical	Infrared absorption spectroscopy	Absorption of infrared radiation leads to vibrational excitation of the atoms that make up the molecule. The vibrational movement of atoms relative to each other results in a change in the length of the bonds and the angles between them	Lecture + laboratory	And laboratory reports

11. Course structure

12	4 theoretical + 3 practical	Atomic absorption	Atomic absorption is a sophisticated analytical technique for identifying most	Lecture + laboratory	Weekly and monthly exams
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			elements		
13	4 theoretical + 3 practical	Interferometers in atomic measurement	There are a number of interferences that affect the results of analysis using the atomic absorption technique, including spectral interferences, ionization interferences, and chemical interferences.	Lecture + laboratory	Weekly and monthly exams
14	4 theoretical + 3 practical	Analysis by electrochemical methods	Electroanalytical chemistry is concerned with the study of quantitative analysis methods that are based on the electrical properties of materials (elements or compounds) when they are part of an electrochemical cell	Lecture + laboratory	Weekly and monthly exams
15	4 theoretical + 3 practical	Reference electrodes are commonly used	Standard calomel electrode, silver-silver chloride electrode standard hydrogen electrode	Lecture + laboratory	Weekly and monthly exams

12. Infrastructure			
: Required readings	principles of Instrumental Analysis, Skoog, Douglas A. West Donald M, UK	UK	Instrumental analysis
*Course books			
*Other			

Special requirements			
	Social services (including, for example, guest lectures, vocational training, and field studies(If conditions exist, lecturers will be invited as guests
			12. Admissions
	Prerequisites		Completing the course means that the student must obtain a passing grade
	The smallest number of students		45 Students
	The largest number of students		150 students