

وزارة التعليم العالي والبحث العلمي
جهاز الإشراف والتقييم العلمي
دائرة ضمان الجودة والاعتماد الأكاديمي

استمارة وصف البرنامج الأكاديمي للكليات والمعاهد للعام الدراسي 2024-2023

الجامعة : بغداد

الكلية /المعهد : العلوم

القسم العلمي : الكيمياء

تاريخ ملء الملف :

التوقيع :

الأستاذة الدكتورة
مهاجر إبراهيم الشيباني
معاون العميد للشؤون العلمية والإدارة العليا

التوقيع :

التوقيع :

اسم المعاون العلمي :

اسم رئيس القسم/نوعه/لغته : د. محمد ياسر عبد الحسين

التاريخ :

التاريخ :

دقق الملف من قبل

شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي : د. أسد بالله زيدان

التاريخ

التوقيع

مصادقة السيد العميد

الأستاذة الدكتورة
زاتون العبد الجبار
عميدة كلية العلوم

Academic Program Description

The graduate program grants a PhD in one of the chemical specializations after completing two courses of 15 weeks and three hours for each course (mandatory and optional) in both courses, passing the comprehensive exam, and submitting and discussing the PhD thesis by a specialized scientific committee, noting that the number of course units is 28 units and the number of thesis units is 32 units. The course description includes the following five chemistry specializations

- .Organic Chemistry -1
- .Inorganic Chemistry -2
- .Analytical Chemistry -3
- .Biochemistry -4

University of Baghdad	1. Educational Institution
College of Science/Department of Chemistry	2. Academic Department/Center
Academic Program for Doctoral Studies in the Department of Chemistry	3. Name of Academic or Professional Program
PhD in Chemistry Sciences (Specialization)	4. Name of Final Certificate
Semester	5. Study System:
None	Annual/Courses/Other
Internet, Seminars, PowerPoint Presentation	6. Accredited Accreditation Program
2023/9/1	7. Other External Influences

Academic Program Objectives

Preparing highly skilled researchers in various chemistry specializations to provide universities, -1 research and educational institutions and other ministries with qualified scientific cadres that keep pace with scientific progress in the world

Keeping pace with developments in curricula, openness and communication with similar scientific -2 institutions inside and outside the country, and keeping pace with the era of development through modern electronic systems

Contributing to enriching human knowledge through specialized studies and serious scientific -3 research to reach innovative scientific and applied additions, and revealing new facts

Encouraging scientific competencies to keep pace with the rapid progress of science and -4 technology and pushing them to creativity and innovation and developing scientific research and

directing it to address what serves society and increasing the college's ability in sustainable .development and serving society

The Chemistry Department should be a model that seeks to achieve a solid scientific level and -5 prepare competent scientists who possess scientific backgrounds and chemical or research skills that enable them to practice their work safely and effectively, and are prepared to keep pace with cognitive and technical progress and strive to obtain higher degrees in various chemical specialties, and contribute to preparing future leaders in scientific and educational fields. Through: striving to meet international standards and requirements for quality and academic accreditation and achieving globality in the quality of educational programs and services provided by the college and competing to advance on international classification lists. Drawing a roadmap for the purpose of improving educational quality and scientific activities within the college and developing programs and plans with .a future vision

Introducing modern educational methods and advanced technologies in teaching methods and -6 preparing high-level educational programs and employing information and communication technologies in the process of transferring and producing knowledge, scientific research and in .preparing curricula for educational programs

Activating the scientific research movement and creating an appropriate climate for creativity and -7 .invention

Providing faculty members capable in terms of efficiency and number to implement the mission of -8 .the college and the department

.Providing a supportive organizational climate and academic environment -9

.Employing scientific research in serving the country's social and developmental issues -10

Activating participation, coordination and integration between the college, the department and the -11 community by holding seminars, conferences and seminars to discuss the country's health and .scientific issues

Contributing to the transfer and production of knowledge and the requirements of building the -12 national system for science and technology through effective participation in seminars, seminars and .local, Arab, international or global conferences

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

.A-A Cognitive objectives

A1- Enabling students to obtain knowledge and understanding of chemistry in all its precise .specializations

A2- Enabling students to obtain knowledge and understanding of the chemical structures of .compounds

A3- - Enabling students to obtain knowledge and understanding of the mechanics of chemical .reactions and methods of detection and diagnosis

.A4- Enabling students to gain knowledge and understanding of practical experiments

A5- Seeking to prepare scientists and researchers with scientific and laboratory skills of a research .nature

A5- Providing educational programs that keep pace with technical development and conducting solid .scientific research and studies

A6- Interacting with scientific and technical experiments and expertise in a manner that serves .society

.A7- Establishing research projects that provide solutions to society's problems

:B- Program specific skill objectives

B1- Providing students with the special skills to know the problems that society suffers from, their causes, how they are distributed and the impact of various factors on them, and knowing the most appropriate ways and means to solve these problems

.B2- Providing students with the basic skills to conduct various scientific studies

B3- The graduate acquires the knowledge and research skills necessary for his academic and professional future

B4- Graduates of this program are prepared either for academic professions or practical professions in other ministries outside of higher education

Teaching and learning methods

.Lecture method and use of interactive whiteboard -1

.Explanation and clarification -2

Providing students with the basics and additional topics related to the outputs of thinking -3
.and chemical analysis for various chemical specializations

Forming discussion groups during lectures to discuss chemistry topics that require thinking -4
.and analysis

Asking students a set of mental questions during lectures such as what, how, when and why -5
.for specific topics

.Giving students homework that requires self-explanations in causal ways -6

Evaluation methods

Research evaluation -1

.Theoretical tests -2

.Reports and studies -3

.Daily exams with self-solved questions -4

.Specific grades for homework -5

.Final exam -6

.Comprehensive exam -7

:C- Emotional and value-based objectives

.C1- Enabling students to understand chemistry in all specializations

C2- Enabling students to solve problems related to the analysis, diagnosis and discrimination
.of chemical compounds

.C3- Enabling students to solve problems related to the intellectual framework of chemistry

.C4- Acquiring the skill of ethical dealing with participants in scientific research

C5- Creating scientific competencies characterized by professionalism, transparency, honesty
.and integrity

Teaching and learning methods

.Lecture method and use of interactive whiteboard -1

.Explanation and clarification -2

Providing students with the basics and additional topics related to the outputs of thinking -3
.and chemical analysis

Forming discussion groups during lectures to discuss chemistry topics that require thinking -4
.and analysis

Asking students a set of mental questions during lectures such as what, how, when and why -5
.for specific topics

.Giving students homework that requires self-explanations in causal ways -6

Evaluation methods

.Evaluating the student's performance during the lecture -1
 Evaluating the student's performance during the field research as part of the practical -2
 .evaluation
 .Short exams during the semester -3
 .Theoretical evaluation exam for the middle and end of the semester -4
 .Comprehensive exam -5
 .Scientific discussion of the doctoral student's thesis -6

D- General and transferable qualification skills (other skills related to employability and
 .(personal development
 D1- Preparing a holder of a higher degree with high mental ability so that he is confident and a
 .decision-maker
 D2- Mastering the basic skills for practicing scientific research theoretically and practically in
 .theoretical chemistry
 D3- Writing and evaluating technical reports and scientific papers in a professional manner in
 .the field of theoretical chemistry
 D4- Evaluating research-based methods, tools and equipment used in chemistry in all
 .specializations
 .D5- Applying the analytical approach and using it in the field of theoretical chemistry
 D6- Applying specialized knowledge in theoretical chemistry and integrating it with related
 .knowledge in his professional practice
 D7- Making optimal use of scientific tools, equipment and resources in development and
 .preservation
 D8- Demonstrating awareness of current problems and modern visions in the field of
 .theoretical chemistry
 .D9- Identifying professional problems and finding solutions to them
 D10- Mastering an appropriate range of professional skills in the field of theoretical chemistry,
 .and using appropriate technological means to serve his professional practice
 .D11- Communicating effectively and being able to lead work teams
 .D12- Making decisions in different professional contexts
 .D13- Employing available resources to achieve the highest benefit and preserving them
 D14- Demonstrating awareness of his role in developing society and preserving the
 .environment in light of global and regional changes
 .D15- Managing time efficiently
 D16- Acting in a manner that reflects commitment to integrity, credibility and commitment to
 .the rules of the profession in the field of theoretical chemistry
 D17- Developing himself academically and professionally and capable of continuous learning
 .in the field of theoretical chemistry
 Teaching and learning methods

.Lecture method and use of interactive whiteboard -1
 .Explanation and clarification -2
 Providing students with the basics and additional topics related to the outputs of thinking -3
 .and chemical analysis

Forming discussion groups during lectures to discuss chemistry topics that require thinking -4
and analysis

Asking students a set of mental questions during lectures such as what, how, when and why -5
for specific topics

.Giving students homework that requires self-explanations in causal ways -6

.Discussions via the electronic class Google Classroom -7

Audio and video lectures via the Google Meet platform -8

Lectures interspersed with PowerPoint Presentations -9

Evaluation methods

.Evaluating the student's performance during the lecture -1

Evaluating the student's performance during the field research as part of the practical -2
evaluation

.Short exams during the semester -3

.Theoretical evaluation exam for the middle and end of the semester -4

.Comprehensive exam and approval of the research plan -5

.Scientific discussion of the doctoral student's thesis -6

1. Program Structure

Credit hours		Course name	Course code	Academic Stage PhD
practical	Theoretical			
	3	Micro Organic Analysis, elemental and Mass Spectrometry		First Course All Specializations
	3	Synthesis reactions involved carbanions and (3,4,5) -membered heterocycles beside studying chemo selectivity and regioselectivity		
	3	Quantum mechanics and kinetic theories of the catalytic reactions		
	3	Bonding in transition-metal complexes and study their stability		
	2	English Language		
	0	Seminar		
	3	Inductivity Coupled Plasma – Atomic		PhD

		Emission Spectroscopy (ICP-AES) & Statistics for Analytical Chemistry		Second Course Analytical Chemistry
	3	Organic reagents in analytical chemistry and their application		
	3	Modern Trends in Analysis of Environmental Pollutants		
	3	Molecular imprinted polymer technology and its application		
	2	scientific research methodology		
	3	Synthesis and reactions of condensed (five, six membered) and azoles heterocyclic		PhD Second course in Organic Chemistry
	3	Application of some reactions in natural products biosynthesis		
	3	Mechanism and Structure in Organic Chemistry		
	3	Chemo selectivity in organic chemistry		
	2	scientific research methodology		
	3	Advanced biochemistry		PhD Second Course Biochemistry
	3	Signal transduction and clinical chemistry correlation		
	3	Advanced molecular biology		
	3	Immunogenetics		
	2	scientific Research Methodology		

-Planning for personal development-

Follow up on scientific developments 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 -

(Admission criteria (setting regulations related to joining the college or institute .1

All applicants for the doctoral program in various chemistry specializations must meet the admission requirements for graduate programs as stipulated in the university's admission policy in addition to the following requirements that must be taken into account for admission to the university:

Hold a master's degree from a university or college accredited by the Ministry of Higher Education or its equivalent -1

.Obtain a passing score on the TOEFL test -2

Complete the application online on the home page of the College of Science - University of Baghdad during the admission period -3

.Pass the competitive exam, scientific test and personal interview -4

.Comparison in admission according to the competition points -5

.(Application mechanism according to the application channels (general and special admission -6

Competition for the specialization (organic chemistry, inorganic chemistry, physical chemistry, biochemistry, analytical chemistry) -7

The most important sources of information about the program .2

Instructions of the Ministry of Higher Education and Scientific Research / Research and Development Department -1

.Instructions of the University Council and the College Council -2

Curriculum Skills Map

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

Required learning outcomes of the program

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
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Micro Organic Analysis , elemental and Mass Spectrometry	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Synthesis reactions involved carbanions and (3,4,5)-membered heterocyclic beside studying chemoselectivity and regioselectivity	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Quantum mechanics and kinetic theories of the catalytic reactions	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Bonding in transition-metal complexes and study their stability	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	English Language	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Seminar	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Inductivity Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES) & Statistics for Analytical Chemistry	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Organic reagents in analytical chemistry and their application	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Modern Trends in Analysis of Environmental Pollutants	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Molecular imprinted polymer technology and its application	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	scientific Research Methodology	

X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Synthesis and reactions of condensed(five, six membered) and azoles heterocyclic	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Chemistry of cyclic imides and isoimides	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Application of some reactions in natural products biosynthesis	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Mechanism and Structure in Organic Chemistry	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	Chemical selectivity in organic chemistry	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	essential	scientific Research Methodology	

PhD / First course All specializations
 Accurate organic analysis, elements and mass spectrometry
 Micro Organic Analysis, elemental and Mass Spectrometry

Course Description

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

Ministry of Higher Education and Scientific Research - University of Baghdad	1. Educational institution
University of Baghdad Scientific	2. Academic department/center
Analytical Chemistry / Micro Organic Analysis, Elemental Analysis and Mass Spectrometry	3. Course name/code
Weekly (Personal Classroom Attendance for PhD Students and All Specializations)	4. Available forms of attendance
First Course - (2023-2024)	5. Semester/year
45 and weekly 3 hours for PhD students	6. Number of study hours (total)
2023 /9/ 1	7. Date this description was prepared

Course objectives

Raising the level of education and the level of graduate students to the scientific and research level required to manage scientific, industrial and academic institutions and to link with all institutions and ministries by providing an important technique in the field of analytical chemistry to analyze elements and organic and inorganic compounds in general through various chemical reactions based on the active groups of organic compounds without suffering from the effects of foreign substances and is characterized by sensitivity to move towards low concentrations and a very small volume to be used in all industrial, environmental, health and scientific research fields. 1.

Course Outcomes and Teaching, Learning and Evaluation Methods
 :A- Knowledge and Understanding or Conventional Objectives
 A1- Obtaining a PhD in Chemistry

Getting acquainted with the technique of analysis using inductively coupled plasma spectroscopy with atomic emission spectroscopy and using it in diagnosing many organic and inorganic compounds, medicines and ions

A2- Applying this technique through working in the field of health, pathological analysis and industry

A3- Applying this technique in the field of the Ministry of Industry and Oil in analyzing and processing petroleum derivatives

A4- Graduating a scientific researcher armed with all analytical techniques in addition to this technique and mechanism and relying on oneself in facing and solving all malfunctions, whether in devices or practical problems for any analytical method

A5- Working in the field of the Ministry of Agriculture and analyzing all pollutants, whether in soil or plants, and knowing their concentrations and selective reagents for their diagnosis

A6- Working in the field of the Ministry of Environment and analyzing all pollutants (air, water, .(soil

B - Course specific skill objectives

B1 -- Develop skills through practical preparation and experiments

B2 - Hold seminars, conferences and study groups

B3 - Hold discussion groups

B4 - Training courses and workshops and acquire initial knowledge in analytical systems and the terminology used and qualify the student to learn about all analytical sciences and develop learning skills in using all analytical devices and all samples available in the local market

Teaching and learning methods

Use technological educational means to facilitate the comprehension of the material, including .1
explanation and discussion

Emphasize the practical aspect and student participation in each electronic lecture .2

Urge students to use the discs prescribed for the material or listen to the lecture electronically .3
with various means of clarification from various websites on the Internet and presentations and
scientific films

Evaluation methods

Written tests - oral tests - observation - daily training - completing assignments - completing
assignments Practical, theoretical and discussion during lectures and final exams

C- Emotional and value objectives

C1-- The ability to monitor and collect environmental data for the purpose of analysis using
available technology

Making the student look at the results from a broad scientific point of view for the purpose of -2
in-depth interpretation

Teaching and learning methods

Using technological educational means to facilitate the comprehension of the material, .1
including explanation and discussion

Emphasizing the practical aspect and student participation in each lecture .2

Explanation and discussion. And making student participation the main focus of learning for .3
.the purpose of enhancing their understanding of the material

Asking students to prepare various activities, reports and topics related to the scientific material .4
.studied

Evaluation methods

Written tests - Daily oral tests - Daily participation - Preparing, writing and discussing
assignments

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

D1- Leadership and effective communication skills to manage scientific and industrial institutions,
.laboratories or pathological analyzes with the least cost and time period

D2- Mastering the skill of dealing with different mechanisms for statistical analysis and data
.processing

.D3- Developing skills and gaining experience through listening, speaking and personal practice

.D4- Using theoretical and practical information and investing it in the actual practical aspect

Evaluation method	Teaching method (in-person)	Unit Name / Topic (First Course - (2023-2024	Required learning outcomes	hours	week
Short and semester exams and daily assignments	Lectures using the blackboard	Analysis of Carbonyl compounds	Carbonyl compounds	3	1
	Lectures using the blackboard	- Analysis of Hydroxyl compounds	Alcohols	3	2
	Lectures using the blackboard	Analysis of Carboxyl compounds Analysis of Amino compounds	Carboxylic acids and amines	3	3
	Lectures using the blackboard	Analysis of Alkoxy & oxyalkylene compounds - Analysis of Epoxide compounds - Analysis of Esters compounds	Oxo compounds	3	4
	Lectures using the blackboard	- Analysis of Anhydride compounds - Analysis of Unsaturation compounds - Analysis of Diazonium salt compounds - Analysis of Hydrazine's & Hydrazides compounds	Miscellaneous compounds	3	5
	Lectures using the blackboard	Analysis of Mercaptans compounds - Analysis of Dialkyl Disulphides compounds - Analysis of Dialkyl Sulphides compounds - Analysis of Sulphoxide compounds - Analysis of Sulphonic acids , Sulphonate Salts & Sulphonamides compounds	Mercaptan compounds	3	7 و 6
	Lectures using the blackboard	Theoretical basis, mechanism of CHNS, CHN and CNS analyzers and molecular weight calculation for element identification	Elemental analysis and molecular weight determination	3	8
	Lectures using the blackboard	Theoretical basis, mechanism and types of ionization sources	Mass spectroscopy	3	9

	Lectures using the blackboard	Types of magnetic fields used and the laws related to them and their effect on the separation of ionic fragments	Mass spectra analysis	3	10
	Lectures using the blackboard	Mathematical laws for identifying the structural or molecular formula	Mass spectra analysis	3	11
	Lectures using the blackboard	Element analysis by mass spectrum and calculating the atomic mass unit of elements and identifying their isotopes	A Mass spectra analysis	3	12
Short and semester exams and daily assignments	Lectures using the blackboard	Writing the proposed possibilities for all organic compounds in detail to identify the organic compound	Mass spectra analysis	3	13 14, 15
	Lectures using the blackboard	Monthly exam.	Exam	3	16

1. Curriculum development plan:
Continue to develop the curriculum based on recent editions of books and references.

Spectrochemical analysis (Ingle & Crouch) 1988 - Modern analytical chemistry (Davide H.) 2000 Principles of quantitative chemical analysis) Robert de Levie1997 – (In addition to the international network of the Internet	Required textbooks
Douglas A.Skoog , Donald M. West & F.James Holler , Stanley R.Crouch , Fundamentals of Analytical Chemistry , 2004 , eight edition , THOMSON , Australlia.	Main references (sources)
(Software and websites)	Recommended books and references (scientific journals, reports, etc.)

<p style="text-align: center;">Fundamentals of Analytical chemistry From (Google chrome)</p>	<p style="text-align: center;">Electronic references, websites, etc.</p>
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PhD / First Course
Synthesis reactions involved carbanions and (3,4,5) -membered heterocycles beside
studying chemo selectivity and regioselectivity

Course Description

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	1. Educational Institution
Department of Chemistry	2. University Department/Center
Preparatory reactions including carbene ion and heterogeneous rings (3,4,5) in addition to the study of chemical and orientational elections	3. Course Name/Code
Attendance in the lecture according to the lists of students' names	4. Available Attendance Forms
First semester / 2023-2024	5. Semester/Year
(3) hours per week	6. Number of Study Hours (Total)
1/9/2023	7. Date this Description was Prepared
Course objectives .2	
<p>The aim of teaching advanced topics in organic chemistry to doctoral students is to broaden students' knowledge of new topics in organic chemistry that they have not previously studied, to identify new reactions, and to work on linking the information base and stock they have in this specialization with new information on reactions, mechanisms, selectivity, activity, protection of .active groups, protection factors with various oxidizing and reducing agents</p>	

Course structure .3

Evaluation method	Teaching method	Name of unit/course or topic	Required learning outcomes	hours	Week
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Introduction of different functional groups on compounds and how to remove them	How to introduce and remove functional groups	3	1
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Chemoselectivity and its role in reactions and preparations	Learn about chemoselectivity	3	2
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Protection of functional groups / reagents / How to remove	Learn how to protect functional groups	3	3
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Activation of substituted groups	Learn about methods of activating groups	3	4
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of directing reactions in specific paths	Learn about directionality of reaction pathways	3	5
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Planning and chemical preparations	Learn about planning organic preparations	3	6
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Preparation of compounds carrying functional groups in (1,2) and (1,3)	Compounds bearing two functional groups at sites (1,2) and (1,3)	3	7
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Preparation of compounds substituted with functional groups in (1,4) and (1,6)	Compounds substituted with functional groups at sites (1,4) and (1,6)	3	8
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Different reactions of active methylene compounds	Study of alkylation, acylation and condensation of	3	9

Seminar Preparation			methylene compounds		
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of thiol and thiophenol compounds / Preparation / Synthesis / Reactions	Learn about thiols and thiophenols	3	10
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of thioether compounds / Preparation / Synthesis / Reactions	Thioethers	3	11
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of different methods for preparing nitriles	Learn about nitriles	3	12
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Reactions of different nitriles with mechanics	Learn about the activity and reactions of nitriles	3	13
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Preparation and reactions of isonitriles	Learn about isonitriles	3	14
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of classification of quinone compounds and different preparation methods	Quinones/classification and preparation methods	3	15
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of different reactions with mechanics of quinone compounds	Learn about the reactions of quinones	3	16
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of preparation methods and reactions for heterogeneous tri and quaternary rings	Learn about the chemistry of heterocyclic tricyclic and quaternary rings	3	17
Discussion, Exams and Seminar Preparation	Lecture with examples and discussion	Study of preparation methods and reactions for pentagonal rings Heterogeneous	Learn about the chemistry of heterocyclic pentacyclic rings	3	18

	1. Infrastructure
	1. Required textbooks

	2. Main references and sources
Scientific journals (various local and international)	1(Recommended books and references)(scientific journals, reports..)
	2(Electronic reference, websites,...)

12. Curriculum development plan	
During the lectures, questions are asked about some points and the student is assigned to them as a homework to be discussed in the next lecture, which increases the student's knowledge and benefit from the scientific discussion.	The curriculum can be developed through:
Assigning students to prepare a seminar on selected topics so that the seminar includes what is mentioned in scientific magazines, books and electronic references, which contributes to the student's scientific enrichment	

PhD first course
Quantum mechanics and kinetic theories of the catalytic reactions

Course Description

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	1. Educational institution
Department of Chemistry	2. Academic department/center
Kinetics of Catalyzed Reactions / First Course	3. Course name/code
Lists of Names	4. Available forms of attendance
First Semester 2023_2024	5. Semester/year
3 Theoretical Hours Per Week	6. Number of study hours (total)
1 /9 /2023	7. Date this description was prepared

أهداف المقرر

The course aims to: Identify the types of reactions, reaction rate theories, and modern techniques used in measurement, and identify the negative and positive conditions that can .affect the rates of speeds and the types of auxiliary factors

Course outcomes, teaching, learning and evaluation methods .5

A- Cognitive objectives

A1-A- Knowledge and understanding

A1-Types of reactions and how to improve their speed determination

A2- Understanding the types of surfaces and the factors affecting each type

A3- Using organic and organic inhibitors for auxiliary factors
A4- Understanding the Arrhenius state enjoyed by important auxiliary factors
A5- Understanding the kinetic theories related to
B- Course skill objectives
B1- Teaching the student to benefit from the Internet and external sources to extract
.research and reports on the subject
.B2- Solving external problems related to the topic
B3- Discussing students within the lecture and asking questions to expand the student's
.understanding

Teaching and learning methods
.Explanations through curves and mathematical functions

Approved books
Paper lectures
Basic scientific books
Modern scientific research
Evaluation methods

Short exams (oral and written) and continuous monthly exams
Reports and research required from the student

C- Emotional and value goals
C1- Communication with students
C2- Reaching scientific thinking and deductive analysis of scientific information

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

D1- Conducting scientific debates with other universities
D2- Ability to gain experience in collecting and analyzing scientific material and giving
seminars

Course structure .4

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	week
Daily and monthly exams and seminars	Power point	Potential energy Diagrams. Kinetics of heterogeneous reaction	Kinetics of reactions	3	1-2
Daily and monthly exams and seminars	Power point	Adsorption and desorption Kinetics, types and rate of adsorption	Adsorption	3	3-4
Daily and monthly exams and seminars	Power point	Kinetic of incorporation. Incorporation and pressure.	Combination	3	6-5
Daily and monthly exams and seminars	Power point	Kinetics of surface reaction.	Surface reactions	1.5	7
Daily and monthly exams and seminars	Power point	Compensation effect in catalytic reaction.	Substitution effect	1.5	8
Daily and monthly exams and seminars	Power point	Catalyst and catalysis and its application. Photocatalytic reaction (Fenton reaction)	Catalyzed reactions	1.5	9
Daily and monthly exams and seminars	Power point	The gases, kinetic molecular theory of gases, types of motion. The theories of reaction rate.	Kinetic theory	3	11-10
Daily and monthly exams and seminars	Power point	Lindman's theory Reaction in solution. Ionic strength, acid, basic catalysis	Reactions in solution	1.5	12
Daily and monthly exams and seminars	Power point	Enzyme kinetics Molecular collision, distribution & velocities, Boltzmann, Maxwell	Enzymatic reactions	1.5	13
Daily and monthly exams and seminars	Power point	Compressibility factor and non-ideal behavior	Ideal and non-ideal gas	1.5	14
Daily and monthly exams and seminars	Power point	Rates and kinetic model of catalytic reaction	Rates of reactions	1.5	15

Infrastructure .5	
Physical Chemistry text book	1- Required textbooks
	2- Main references (sources)
Internet and electrochemistry Modern Electrochemistry	A) Recommended books and references (scientific journals, reports, etc.)
	B) Electronic references, Internet sites

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

PhD/First Course

Bonding in transition-metal complexes and study their stability

Course Description

Study of the valence bond theory, its benefits and limitations, crystal field theory, applications of crystal field stability energy - and oxide mixtures, molecular orbital theory, comparison between the three theories

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Cohesion in Transitional Metal Complexes and Stability Study	3. Course name/code
Weekly	4. Available forms of attendance
First Semester / 2023-2024	5. Semester/year
45 Hours	6. Number of study hours (total)
2023\9\1	7. Date this description was prepared
Course objectives .8 -1 Preparing and qualifying students for the labor market, by preparing specialized cadres in chemistry sciences capable of working in the field of specialization -2 .Comprehensive knowledge of the sciences and basic principles related to chemistry sciences -3 Preparing, qualifying and following up on postgraduate studies by developing their intellectual, scientific and research skills -4 .Expanding and deepening students' information and skills in the field of chemistry sciences -5 .Enabling students to think and write scientific reports and research -6 .Students acquire the ability to research and learn in the fields of chemistry sciences -7 Providing service to the community in all fields of chemistry sciences related to industrial, environmental, health, agricultural and other research -8 Refining the student's scientific and laboratory personality so that he can serve and develop the community The extent of information derived from them and the determinants of these theories, the theory of the valence bond and its benefits and determinants, the theory of the crystal field, applications of	

the energy of the stability of the crystal field - and the mixture of oxides, the theory of the
.molecular orbital, a comparison between the three theories
Students acquire applied and experimental skills through theoretical and laboratory scientific -9
.topics

.Students are familiar with the latest developments in the fields of chemistry and technology -10

Course outcomes, teaching, learning and evaluation methods .9

.A- Cognitive objectives

A1- The student should be able to identify the nature of the bond between the metal and the ligand
A2- Identify the characteristics of the bond between the metal and the ligand and how to represent it
orbitally

:B- Program specific skill objectives

B1- Identify the currently adopted theories to describe the nature of the bond between the metal and
the ligand

B2- Identify the information derived from the application of bonding theories and benefit from
them

Teaching and learning methods

Traditional lecture + Power Point presentation lecture -1

Preparing reports and homework -2

Evaluation methods

Research evaluation -1

Theoretical tests -2

.Reports and studies -3

.Daily exams with self-solved questions -4

.Grades determined by homework -5

.Final exam -6

.Comprehensive exam -7

:C- Emotional and value objectives

C1- Discussions

C2- Reports and homework

Teaching and learning methods

Using modern illustrative means such as display screens, displaying pictures, drawings and models

Evaluation methods

Student contribution to discussions -1

Evaluation of commitment to attendance -2

Discussion of reports -3

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

D1- Encouraging students to rely on some sources in preparing reports
D2- Clarifying the general foundations in classifying materials and identifying their cognitive importance

Course structure .10					
Evaluation Method	Teaching method	Unit name / or topic	Required learning outcomes	hours	Week
Exams Homework Attendance	Traditional lecture + power point lecture	The emergence of coordination compounds and their types	Development of coordination compounds and their classes	3	First
Exams Homework Attendance	Traditional lecture + power point lecture	Old theories to describe the structure of coordination compounds	Old's theories for describing the structure of coordination compounds	3	Second
Exams Homework Attendance	Traditional lecture + power point lecture	Types of ligands and isomerism in coordination compounds and Sedwick's principle for the electronic description of the coordination bond	Types of ligands and isomerism in coordination compounds. The Sedwick concept for the electronic description of the coordinate bond	3	Third
Exams Homework Attendance	Traditional lecture + power point lecture	The importance and applications of the effective atomic number rule for coordination compounds and Paulinck's rule of electronic equivalence	The importance and applications of the effective atomic number rule for coordination compounds and electro-neutralization principle for Paulink	3	Fourth
		Exam	Exam.	3	Fifth
Exams Homework Attendance	Traditional lecture + power point lecture	The foundations of hybridization and the properties of hybrid orbitals and their orbital representation	The foundations of hybridization and the properties of hybrid orbitals and their orbital representation	3	Sixth
Exams Homework Attendance	Traditional lecture +	Modern bonding theories - hypotheses and the extent of	Modern contemporary	3	Seventh

	power point lecture	information derived from them and the limitations of these theories	theories - hypotheses, extent and the information resulted from these theories and their limitations		
Exams Homework Attendance	Traditional lecture + power point lecture	The theory of valence bond and its benefits and limitations	Valence Bond Theory (VBT) and its advantages and limitations	3	Eighth
Exams Homework Attendance	Traditional lecture + power point lecture	The theory of crystal field	Crystal Field Theory (CFT)	3	Ninth
Exams Homework Attendance	Traditional lecture + power point lecture	Continuity	Cont.....	3	Tenth
Exams Homework Attendance	Traditional lecture + power point lecture	Applications of the stability energy of the crystal field - and the mixture of oxides	Applications of CFSE and Spinel Oxides	3	Eleventh
Exams Homework Attendance	Traditional lecture + power point lecture	The theory of molecular orbitals	Molecular Orbital Theory (MOT)		Twelfth
Exams Homework Attendance	Traditional lecture + power point lecture	Comparison between the three theories	Comparision between the Three Theories		Thirteenth
		Exam	Exam.	3	Fourteenth

11. Infrastructure	
G.L.Miessler and D.A.Tarr , Inorganic chemistry . 2nd Ed, Prentice Hall, Upper Saddle , River, NJ, (1999).	1- Required textbooks
Satya prakash G.D. Tuli S.K. Basu R.D. Madan, Advanced Inorganic Chemistry Volume II (2008). F.A.Cotton and G.Wilkinson Basic inorganic chemistry.3rdEd,Wiley New york, (1995) .	2- Main references (sources)

Chemistry of transition elements Coordination Bonds Inorganic chemistry	3- Recommended books and references (science journals, reports,)
.Electronic references were used	Electronic references, websites-4

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

PhD, second course, Analytical Chemistry specialization

Inductivity Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES) & Statistics for Analytical Chemistry

Course Description

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

Ministry of Higher Education and Scientific Research - University of Baghdad	1. Educational institution
University of Baghdad Scientific	2. Academic department/center
Analytical Chemistry / Inductive Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES)	3. Course name/code
Inductive Coupled Plasma Spectroscopy and Data Processing	4. Available forms of attendance
Weekly (classroom attendance for PhD students)	5. Semester/year
Second Course - (2023-2024)	6. Number of study hours (total)
2023 /9/ 1	7. Date this description was prepared

Course objectives

Raising the level of education and the level of graduate students to the scientific and research level required to manage scientific, industrial and academic institutions and to link with all institutions and ministries by providing an important technology in the field of analytical chemistry to analyze elements and organic and inorganic compounds in general through direct or indirect injection of the material to be analyzed into the plasma torch, which operates at high temperatures of up to 10,000 degrees without suffering from the effects of foreign substances and is characterized by sensitivity to moving towards low concentrations and a very small volume to be used in all industrial, environmental, health and scientific research fields.

7. Course Outcomes, Teaching, Learning and Evaluation Methods

:A- Knowledge and Understanding or Conventional Objectives

A1- Obtaining a PhD in Chemistry

Getting acquainted with the technique of analysis using inductively coupled plasma spectroscopy with atomic emission spectroscopy and using it in diagnosing many organic and inorganic compounds, medicines and ions

A2- Applying this technique through working in the field of health, pathological analysis and industry

A3- Applying this technique in the field of the Ministry of Industry and Oil in analyzing and processing petroleum derivatives

A4- Graduating a scientific researcher armed with all analytical techniques in addition to this technique and mechanism and relying on oneself in facing and solving all malfunctions, whether in devices or practical problems for any analytical method

A5- Working in the field of the Ministry of Agriculture and analyzing all pollutants, whether in soil or plants, and knowing their concentrations and selective reagents for their diagnosis

A6- Working in the field of the Ministry of Environment and analyzing all pollutants (air, water, (soil

B - Course specific skill objectives

B1 -- Develop skills through practical preparation and experiments

B2 - Hold seminars, conferences and study groups

B3 - Hold discussion groups

B4 - Training courses and workshops and acquire initial knowledge in analytical systems and the terminology used and qualify the student to learn about all analytical sciences and develop learning skills in using all analytical devices and all samples available in the local market

Teaching and learning methods

Use technological educational means to facilitate the comprehension of the material, including .1
 explanation and discussion

Emphasize the practical aspect and student participation in each electronic lecture .2

Urge students to use the discs prescribed for the material or listen to the lecture electronically .3
 with various means of clarification from various websites on the Internet and presentations and scientific films

Evaluation methods

Written tests - oral tests - observation - daily training - completing assignments - completing assignments Practical, theoretical and discussion during the lecture and final exams

C- Emotional and value objectives

C1-- The ability to monitor and collect environmental data for the purpose of analysis using available technology

Making the student look at the results from a broad scientific point of view for the purpose of -2
 in-depth interpretation

Teaching and learning methods

Evaluation methods

Written tests- Daily oral tests- Daily participation- Preparing, writing and discussing assignments

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

D1- Leadership and effective communication skills to manage scientific and industrial institutions, laboratory or pathological analyses with the least cost and time

D2- Mastering the skill of dealing with different mechanisms for analysis and statistical processing of data

D3- Developing skills and gaining experience through listening, speaking and personal practice

D4- Using theoretical and practical information and investing it in the actual practical aspect

Course structure .6					
Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	Week

Short exams and daily homework assignments	Delivering lectures in person	<ul style="list-style-type: none"> - Introduction , History , Definition , mechanism - Advantage & disadvantage of ICP- AES 	Mechanism principle	3	1
	Delivering lectures in person	<ul style="list-style-type: none"> - Composition & mechanism for the formation of plasma torch - Type of spectrophotometric coupled with ICP- AES - Type of ICP- AES . 	Mechanism of action, principles, mechanism, types and applications	3	2
Short exams and daily homework assignments	Delivering lectures in person	<ul style="list-style-type: none"> - Type of detectors of ICP- AES . - Effect of organic solvent in ICP- AES . - Nebulization & type of nebulizer in ICP- AES . 	Spraying, mechanism and applications	3	3
	Delivering lectures in person	<ul style="list-style-type: none"> - Type of methods for sampling - Internal standard in ICP- AES . 	Modeling methods (principles and applications)	3	4
	Delivering lectures in person	<ul style="list-style-type: none"> - Type of interferences in ICP- AES . - Measurement for ICP- AES . - Application in ICP- AES . 	Interferometers and application	3	5
	Delivering lectures in person	Type of introduction & solubility	Sample introduction and dissolution methods	3	7 و 6
	Delivering lectures in person	<ul style="list-style-type: none"> - Type of methods for sample introduction - Different techniques coupled with ICP- AES . - IR & FTIR coupled with ICP- AES (INSTRUMENTAL , THEORY, PRINCIPLE , MECHANISM , USES & APPLICATION) . 	Conjugated spectroscopic techniques (IR and FTIR spectroscopy) principles, mechanism and applications	3	8

	Delivering lectures in person	- LASER coupled with ICP- AES (INSTRUMENTAL , THEORY, PRINCIPLE , MECHANISM , USES & APPLICATION) .	Laser spectroscopy (principles, mechanism and applications)	3	9
Short exams and daily homework assignments	Delivering lectures in person	- Microwave coupled with ICP- AES (INSTRUMENTAL , THEORY, PRINCIPLE , MECHANISM , USES & APPLICATION) . - X-Ray coupled with ICP- AES (INSTRUMENTAL , THEORY, PRINCIPLE , MECHANISM , USES & APPLICATION) .	Spectroscopic methods of analysis (microwave and X-Ray spectroscopy) principles, mechanism and applications	3	10
	Delivering lectures in person	- HPLC coupled with ICP- AES (INSTRUMENTAL , THEORY, PRINCIPLE , MECHANISM , USES & APPLICATION) .	Methods of separation by column	3	11
	Delivering lectures in person	Thermal Analysis coupled with ICP- AES (INSTRUMENTAL , THEORY, PRINCIPLE , MECHANISM , USES & APPLICATION) .	Principles, mechanism and applications	3	12
Short and midterm exams	Delivering lectures in person	Hydride generation coupled with ICP- AES (INSTRUMENTAL , THEORY, PRINCIPLE , MECHANISM , USES & APPLICATION) ..	Thermal analysis (Principles, mechanism and applications)	3	13
	Delivering lectures in person	- Treatment of data - Practical Statistics for the Analytical Scientist - Accuracy (mean results) - Precision or Spread of Data (Dispersion)	Metal hydride generation	3	و 14 15

		- Distribution Descriptives Calibration graph & standard addition graph			
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1. Curriculum development plan:
Continue to develop the curriculum based on recent editions of books and references.

	1. Infrastructure
Spectrochemical analysis (Ingle & Crouch) 1988 - Modern analytical chemistry (Davide H.) 2000 Robert de) Principles of quantitative chemical analysis 1997 – (Levie In addition to the international network of the Internet	1- Required textbooks
Douglas A.Skoog , Donald M. West & F.James Holler , Stanley R.Crouch , Fundamentals of Analytical Chemistry , 2004 , eight edition , THOMSON , Australlia.	2- Main references (sources)
(Software and websites)	a) Recommended books and references (scientific journals, reports,)
Fundamentals of Analytical chemistry Google chrome	b) Electronic references, websites,

PhD, second course, Analytical Chemistry
Organic reagents in analytical chemistry and their application

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
Chemistry	2. Academic Department/Center
Department of Chemistry	3. Name of Academic or Professional Program
PhD Chemistry	4. Name of Final Certificate
Semester / Analytical Chemistry	5. Academic System:
Ministry of Higher Education and Scientific Research	Annual/Courses/Other
None	6. Accredited Accreditation Program
2023/9/15	7. Other External Influences

Academic Program Objectives .1

Three main objectives for the Analytical Chemistry course /K1/PhD students for the year 2023/2024

First/The cognitive tool in the accurate organic analysis of active groups in organic compounds and proposing different analytical methods sensitive to the quantitative estimation of these active groups in the form of colored complexes, including carbonyl and hydroxyl groups, amines, carboxylic acids and their derivatives

Secondly/Elemental analysis of some important elements such as C, H, N, S using element analyzers CHN, CHNS, CNS and studying the working mechanism of the devices and applications and calculation paragraphs to find the simplified formula for any organic compound Empirical formula mathematically and suggesting Molecular F. for any organic compound

Thirdly/Basics of mass spectrometry, ionization sources for the model by bombarding the model with electrons in the ionization source and MS applications in finding the relative atomic mass of the branched parts and predicting in suggesting mass spectra for many elements and organic compounds through 1- The mass of isotopes 2- The relative abundance of the isotope

Required program outputs and teaching, learning and evaluation methods .1
 .A-A Cognitive objectives

A1- How to predict the resulting mass spectrum for a specific element or organic compound from the mass of isotopes and the relative abundance of the isotope to find the relative atomic mass in Dalton units

A2- Finding sensitive and accurate methods for the spectral estimation of important organic compounds that contain active groups that interact with elements or drugs by forming colored complexes that absorb at the highest wavelength proportional to the concentration and the possibility of separating and estimating mixtures of compounds, including sulfonic acid, sulfonates, and mercaptans, and estimating hydrazine, hydrazide, nitrile, and sulfonamide drugs using reducing agents. A3- Predicting the chemical formula of any unknown compound containing a percentage of the elements H, N, S, O, C through calculations of the empirical formula and molecular formula

:B- Program skill objectives

B1- The ability to solve mathematical problems related to the simplified formula of any compound and the molecular weight of the simplified formula and use element analyzers to estimate the elements C, H, N, S in the form of gases SO₂, H₂O, CO₂, NO₂

B2- The ability to solve MS mass spectrometry questions and find the relative atomic mass and through m/z for multiple isotopes of any element or compound

B3- Separating and estimating mixtures of important organic compounds using the basics of advanced analytical chemistry in the vocabulary of accurate organic analysis and innovating new sensitive analytical methods by spectral estimation of many organic and inorganic elements and compounds, drugs, pesticides, biological and environmental models

B4- Helping students use important electronic programs that facilitate their understanding of the material and encouraging them to read, follow up, and derive ideas in proposing formulas for other questions and solving them

Teaching and learning methods

:Teaching and learning methods are divided into several attempts

Realistic lectures in classrooms -1

.Creating a channel on the Telegram program with doctoral students -2

Creating an electronic class with students to copy the approved academic program lectures, -3 questions and their solutions, some homework, inquiries and clarifications related to the material

Using additional electronic programs to meet students directly Google Meet, FCC, Zoom, etc. to -4 facilitate the task of teaching students and their understanding of the material

Evaluation methods

:C- Emotional and value goals

C1- Renewing students' confidence in themselves from a scientific point of view and through classroom and extracurricular discussions

C2- The relationship between the professor and the student is always positive and correct and is built on mutual respect

A3- The professor's affection and respect for the student gives the student an effective incentive to work hard and raise his academic level

A4- The student's awareness and understanding of the harms of smoking and drugs on health and society

Teaching and learning methods

Modern methods are used in education in addition to real lectures in classrooms, including the use of Google Classroom and sending some audio and video files to the electronic class

Evaluation methods

Short exams were conducted inside the classroom and homework assignments were given, as well - as monthly exams in addition to informing students to prepare research and reports related to the .academic program components for this course

The attendance and absence list plays an effective role in evaluating students and giving them - .grades for attendance to encourage students not to be absent and understand the lecture

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

D1- Through the professor's positive relationship with the doctoral student throughout the course, the student is qualified to be a responsible and leading person in the future and to have a strong personality to manage and teach the scientific material, whether in classrooms or participating in .conferences

D2- The student's ability to participate effectively in seminars and workshops held in the scientific .departments first and in their departments second

D3- Active participation in the classroom and relying on students to solve some mathematical problems and discuss the solutions contributes to supporting the educational process as important .elements capable of successful actual management in other ministries

D4- For personal development, scientific sources and references and terms related to and specific to .the course are used
Teaching and learning methods

Modern methods are used in education in addition to real lectures in classrooms, including the use of .the Google Classroom program and sending some audio and video files to the electronic class
Evaluation Methods

Short exams were conducted inside the classroom, homework assignments were given, and monthly - exams were conducted, in addition to informing students to prepare research and reports on the .academic program components for this course

The attendance and absence list plays an effective role in evaluating students and giving them - grades for attendance to encourage students not to be absent and to understand the lecture

Program structure .1				
Credit hours		Course name	Course code	Academic stage
practical	theoretical			
(Three hours per week (theoretical		Analytical chemistry	/	PhD / First Course

Planning for personal development .1

Acquiring self-education skills for students that enable them to update their scientific - .information in the field of precise scientific specialization

Using electronic simulations of some videos published on social media sites such as - YouTube and others and benefiting from the experiences of the outside world that relied on (electronic education and blended education (blended and electronic learning

(Admission criteria (setting regulations related to joining the college or institute .2
Based on the competitive exam for doctoral students approved by the Ministry, they -
.were accepted to study for a doctorate and on different channels
.Based on the expansions approved by the Ministry -
The most important sources of information about the program .3
-principles of instrumental of analysis by skoog ,Holler and Niman 5th edition - principles
of instrumental of analysis by skoog ,Holler and Grouch 6th edition .
- fundamental of analytical chemistry by skoog ,west , Holler 6th edition

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	week
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Analysis of carbonyl groups	Analysis of carbonyl groups	3	First
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Analysis of Hydroxyl groups	Analysis of hydroxyl groups	3	Second
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Analysis of carboxylate groups and Amino comp.	Analysis of carboxyl groups and amino compounds	3	Third
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Analysis of alkoxy and oxy alkene	Analysis of alkoxy and oxyalkenes	3	Fourth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Analysis of Epoxides and Esters	Analysis of epoxides and esters	3	Fifth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Analysis of Hydrides and unsaturated compounds of diazonium salts	Analysis of anhydrides and unsaturated compounds of diazonium salts	3	Sixth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	analysis Hydrazine and Hydrazide and mercaptan comp. and dialkyl disulphide	Analysis of hydrazine and hydrazide and analysis of mercaptan compounds and dialkyl disulfide	3	Seventh
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Analysis of dimethyl, monosulfide, sulfoxide, sulfonic acid and sulfonate salts	Analysis of dialkyl and monosulfide compounds, sulfoxides, sulfonic acid and sulfonate salts	3	Eighth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Sulfonamide analysis and microelemental analysis by CHNS and CHN analyzer	Analysis of sulfonamide compounds and elemental microanalysis CHNS and CHN analyzer	3	Ninth

Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Empirical formular and molecular formular and calculation	Empirical formular and molecular formular and calculation	3	Tenth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Principles of mass spectroscopy and instrumentation – ionization sources	Principles of mass spectroscopy and instrumentation – ionization sources	3	Eleventh
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Ion separators :single-focusing magnetic Deflection, Double-Focusing	Ion separators :single-focusing magnetic Deflection, Double-Focusing	3	Twelfth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Cycloidal focusing ,Time of Flight ,Rules inMS , type of cleavage ,McLafferty rearrangement	Cycloidal focusing ,Time of Flight ,Rules inMS , type of cleavage ,McLafferty rearrangement	3	Thirteenth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Mass spectra of elements , Elements with more abundant heavy Isotops	Mass spectra of elements , Elements with more abundant heavy Isotops	3	Fourteenth
Weekly exams and monthly exams	Paper -1 lectures 2- Electronic screen	Mass spectra of Organic compounds : Alkanes , Branched Alkanes , Aromatic compounds , Alkenes ,Alkynes ,Aldehydes , Ketones , Esters ,Carboxylic acid ,Amides , Acid halide , Alcohol ,Halogenated compounds.	Mass spectra of Organic compounds : Alkanes , Branched Alkanes , Aromatic compounds , Alkenes ,Alkynes ,Aldehydes , Ketones , Esters ,Carboxylic acid ,Amides , Acid halide , Alcohol ,Halogenated compounds.	3	Fifteenth

PhD, second course, Analytical Chemistry
Molecular imprinted polymer technology and its application
Course Description

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	1. Educational institution
Chemistry	2. Academic department/center
Molecular Polymer Imprinting Technology and its Applications	3. Course name/code
In-person	4. Available forms of attendance
Second Semester/2023-2024	5. Semester/year
3 Hours	6. Number of study hours (total)
2023/9/1	7. Date this description was prepared

Course objectives

Students are introduced to the basics of molecular polymer chemistry and their importance in -1
chemical analysis is studied

Teaching students about the materials used in molecular polymer chemistry technology -2

Teaching students to identify chemicals using molecular polymer chemistry technology -3

Introducing students to the types of molecular polymer chemistry -4

Teaching students about molecular polymer chemistry applications -5

How to analyze a mixture of materials in the model 6

Course outcomes and teaching, learning and evaluation methods .1

A- Cognitive objectives

A1- Quantitative and qualitative identification of the substance to be analyzed

A2- Learning the calculations necessary to know the quantity of the substance to be analyzed

A3- Teaching students to know the correct method of identification of the substance to be analyzed

B- Course skill objectives

B1- Scientific and theoretical education in understanding the basics of molecular polymer chemistry

B2- Scientific convergence between theoretical curricula and practical reality

B3- Finding appropriate statistical and analytical methods in how to identify chemicals And its analysis

-B4

C- Emotional and value goals

C1- The student's feeling that he is a scientific part of the scientific institution

C2- Building an advanced generation of the scientific pillar, the goal of which is to maintain the main role of the scientific curriculum

C3- Bringing the student to an advanced stage of scientific awareness, and this can be invested in the future

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 the scientific motivation factor

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

Teaching and learning methods

Using known learning methods by explaining the theoretical material -

Using the electronic screen and electronic programs as a means to display important information during the explanation -2

.Creating an electronic class and a channel on the Telegram website -3

Adopting specialized books to provide the student with scientific foundations -4

Evaluation methods

Monthly written tests -1

Asking inferential questions during the lecture and preparing homework -2

Conducting a quick daily exam during the lecture time -3

Students must be involved in the scientific discussion during the lecture -4

Scientific and literary commitment is a priority in the evaluation process

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

D1- Urging them to use scientific books to benefit from them scientifically

D2- Clarifying the future goals of students, which generates the scientific motivation factor

D3- Making the scientific institution the largest incubator for students, which generates the sense of belonging

Course Structure .8

طريقة التقييم	Teaching method	Unit name/topic	Required learning outcomes	hours	week
Weekly Exams and Reports	Paper lectures and electronic screen	Introduction of molecular imprinting Principal methodologies of assembling recognition site functionality	Introduction of molecular imprinting Principal methodologies of assembling recognition site functionality	3	1
Weekly Exams and Reports	Paper lectures and electronic screen	Factors affecting the imprinting process Template	Factors affecting the imprinting process Template	3	2
Weekly Exams and Reports	Paper lectures and electronic screen	Functional monomer Cross-linking monomers	Functional monomer Cross-linking monomers	3	3
Weekly Exams and Reports	Paper lectures and electronic screen	Rational design of MIPs	Rational design of MIPs	3	4
Weekly Exams and Reports	Paper lectures and electronic screen	Imprinted bead formation	Imprinted bead formation	3	5
Weekly Exams and Reports	Paper lectures and electronic screen	Precipitation polymerization	Precipitation polymerization	3	6
Weekly Exams and Reports	Paper lectures and electronic screen	Particle size distribution analysis	Particle size distribution analysis	3	7
Weekly Exams and Reports	Paper lectures and electronic screen	Adsorption Isotherms	Adsorption Isotherms	3	8
Weekly Exams and Reports	Paper lectures and electronic screen	Isotherm models	Isotherm models	3	9

Weekly Exams and Reports	Paper lectures and electronic screen	Particle size studies to investigate the effect of solvents on MIPs	Particle size studies to investigate the effect of solvents on MIPs	3	10
Weekly Exams and Reports	Paper lectures and electronic screen	Scanning electron microscopy (SEM) studies	Scanning electron microscopy (SEM) studies	3	11
Weekly Exams and Reports	Paper lectures and electronic screen	Nuclear Magnetic Resonance (NMR) studies	Nuclear Magnetic Resonance (NMR) studies	3	12
Weekly Exams and Reports	Paper lectures and electronic screen	Fourier Transform Infra-Red (FTIR) analysis	Fourier Transform Infra-Red (FTIR) analysis	3	13
Weekly Exams and Reports	Paper lectures and electronic screen	Solid-State Nuclear Magnetic Resonance spectroscopy	Solid-State Nuclear Magnetic Resonance spectroscopy	3	14
Weekly Exams and Reports	Paper lectures and electronic screen	MIP applications Affinity separation Sensors Drug-delivery	MIP applications Affinity separation Sensors Drug-delivery	3	15

1. Infrastructure

- 1- Molecularly Imprinted Polymers Karsten Haupt, Ana V. Linares, Marc Bompert, and Bernadette Tse Sum Bu 2012
2- 1st Edition
Molecular Imprinting
Principles and Applications of Micro- and Nanostructure Polymers
Edited By Lei Ye 2013

1- Required textbooks

Handbook of Molecular Imprinting
Advanced Sensor Applications

2- Main references (sources)

A) Recommended books and references
(scientific journals, reports, etc.)

 ,a) Electronic references, websites
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1. Curriculum development plan
Introducing the foundations of new techniques and methods for linking with molecular polymer printing technology

PhD/Second Course
Specialization: Analytical Chemistry
Modern Trends in Analysis of Environmental Pollutants

Course Description

Study of environmental pollutant analysis for doctoral students / second semester Basics of analysis of types of environmental pollutants and methods used in the analysis of environmental pollutants. It includes a technical study of different types of devices and their .uses in the analysis of environmental pollutants

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Modern Trends in Environmental Pollutant Analysis	3. Course name/code
Weekly	4. Available forms of attendance
Second Semester / 2023-2024	5. Semester/year
45 Hours	6. Number of study hours (total)
2023\9\1	7. Date this description was prepared

Course objectives .8

This program offers a course on modern trends in the analysis of environmental pollutants for doctoral students / second semester, basics of analysis of types of environmental pollutants and methods used in the analysis of environmental pollutants. It includes a technical study of different types of devices and their .uses in the analysis of environmental pollutants

Course outcomes, teaching, learning and evaluation methods .9

.A- Cognitive objectives

- A1- Identify the different methods for collecting polluted environmental samples and benefiting from them .in analytical chemistry
- .A2- Identify the different environmental pollutants, water, soil and air pollutants
- .A3- Identify the types of environmental pollutants
- A4- Identify the methods for finding concentrations of pollutants and comparing them with international .standards
- .A5- Identify the mechanisms used to get rid of environmental pollutants

:B- Program specific skill objectives

- .B1- Teaching the student how to use laboratory devices to collect polluted samples
- .B2- Teaching the student how to conduct laboratory analyses of polluted samples
- B 3- 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

B 4- Teaching the student to benefit from the Internet to extract research and summary reports on the prescribed practical material
Teaching and learning methods

Clarifying the scientific material through approved analytical books and creating paper lectures to -1
.explain the mechanisms used to analyze polluted water, soil, or air samples

Using Google classroom to display lectures in the form of video recording and communicating with the -2
.student

.Proposed discussion within the lecture -3

.(Continuously benefiting from the World Wide Web (Internet -4
Evaluation methods

Conducting short surprise exams every week so that the student is aware and continuously reading the 1 -1
.curriculum

Conducting monthly exams using Google forms and evaluating external reports and research required -2
.from the student

.Conducting electronic tests -3 -3

:C-Emotional and value objectives

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

Teaching and learning methods

Clarifying the scientific material through approved analytical books and creating paper lectures to explain
.the mechanisms used to analyze polluted water, soil, or air samples

Using Google classroom to display lectures in the form of video recordings and communicating with the
.student

.Suggested discussion within the lecture

.(Continuous use of the World Wide Web (Internet
Evaluation methods

.Evaluating the student's performance during the lecture -1

.Evaluating the student's performance during the field research as part of the practical evaluation -2

.Short exams during the semester -3

.Theoretical evaluation exam for the middle and end of the semester -4

.Comprehensive exam -5

.Scientific discussion of the doctoral student's thesis -6

D- General and transferable qualification 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 and multimedia

D3- Developing the student's ability to dialogue and discuss, thus enabling him to pass professional tests
.organized by local/regional/international bodies
D4- Managing time and working within the specified time

Course structure .10

Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	Week
Weekly exams and reports	Paper -1 lectures 2- Electronic screen	Introduction	Collecting contaminated samples	6	1-2
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Methods used in collecting water samples	Collecting contaminated samples	6	4-3
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Introduction to the analyses used in the analysis of polluted water	Chemical tests of water	6	6-5
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Measuring pH, hardness, sulfates for polluted water	Chemical tests of water	3	7
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Measuring residual chlorine, dissolved oxygen, organic compounds	Chemical tests of water	3	8
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Measuring fats and lipids, phosphates, nitrogenous compounds	Chemical tests of water	3	9
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Measuring phenols, metals	Chemical tests of water	6	11-10
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Definition of air pollution	Chemical tests of polluted air	3	12
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Measuring hydrocarbons, carbon monoxide	Chemical tests of polluted air	3	13
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Measuring nitrogen oxides	Collecting contaminated samples	3	14
Weekly exams and reports	1- Paper lectures 2- Electronic screen	Introduction	Collecting contaminated samples	3	15

10. بنية المقرر					
Evaluation method	Teaching method	Unit name/topic	Required learning outcomes	hours	Week
Daily and monthly exams and seminars	Power point	nanochemistry	Review of nanochemistry	3	First
Daily and monthly exams and seminars	Power point		definitions	3	Second
Daily and monthly exams and seminars	Power point		properties,	6	Third and Fourth
Daily and monthly exams and seminars	Power point		identification	3	Fifth
Daily and monthly exams and seminars	Power point		preparation	3	Sixth
Daily and monthly exams and seminars	Power point		preparation	3	Seventh
Daily and monthly exams and seminars	Power point		the chemistry of - carbon nanomaterials	3	Eighth
Daily and monthly exams and seminars	Power point		Quantum dots -	3	Ninth
Daily and monthly exams and seminars	Power point		Dendrimers -	3	Tenth
Daily and monthly exams and seminars	Power point		Nanotemplats	3	Eleventh
Daily and monthly exams and seminars	Power point		Nanofluid	3	Twelfth
Daily and monthly exams and seminars	Power point		Smart materials	3	Thirteenth
Daily and monthly exams and seminars	Power point		Nano biochemistry	3	Fourteenth
Daily and monthly exams and seminars	Power point		امتحان	3	Fifteenth

**PhD / Second Course
Organic Chemistry Specialization
Chemistry of cyclic imides and isoimides**

Course Description

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	1. Educational Institution
Department of Chemistry	2. University Department/Center
Chemistry of Imides and Cyclic Isoimides / PhD	3. Course Name/Code
Attendance at the lecture according to the lists of students' names	4. Available Attendance Forms
Second semester / 2023-2024	5. Semester/Year
(3) hours per week	6. Number of Study Hours (Total)
1/9/2023	7. Date this Description was Prepared
Course objectives	

The aim of teaching the chemistry of imides and cyclic isoimides to doctoral students is to introduce students to compounds of great importance with various applications in the fields of medicine/pharmaceutical and pharmaceutical preparations/plastics industry, dyes and others, in addition to their multiple biological activities.

During the study, the student learns about the chemistry of these compounds in terms of preparation methods, reactions and applications.

60. Learning outcomes and teaching, learning and assessment methods

B. Cognitive objectives

A1. Expand students' knowledge of imides and cyclic isoimides and identify the nature of their composition

A2. Expand students' knowledge of the different preparation methods for this class of compounds

A3. Expand students' knowledge of the reactions they enter into and how to diagnose them using spectroscopic and other methods

Course structure					
Evaluation method	Teaching method	Name of unit/course or topic	Required learning outcomes	hours	Week
Exams and Seminar Preparation	Lecture in person with examples and discussion	Study of the chemical structures of imides and isoimides	Identify the structure of imides and isoimides	3	1
Exams and Seminar Preparation	Lecture in person with examples and discussion	Methods of preparing different imides with mechanics and examples	Identify methods of preparing imides	3	2
Exams and Seminar Preparation	Lecture in person with examples and discussion	Following the Diels-Alder reaction to prepare the complex with imide	Preparation of Diels-Alder complexes of some imides	3	3
Exams and Seminar Preparation	Lecture in person with examples and discussion	Preparation by using water-repellent agents or by melting	Thermal methods and the use of different water-repellent agents	3	4
Exams and Seminar Preparation	Lecture in person with examples and discussion	Using selective water-repellent agents in preparing isoimides	Preparation of cyclic isoamides	3	5
Exams and Seminar Preparation	Lecture in person with examples and discussion	Mechanical steps in preparing imides and isoimides	Mechanism of preparation of imides and isoimides	3	6
Exams and Seminar Preparation	Lecture in person with examples and discussion	Following the usual methods and microwave method to prepare unsubstituted imides	Preparation of unsubstituted cyclic imides	3	7
Exams and Seminar Preparation	Lecture in person with	The most important reactions of cyclic imides	Cyclic imide reactions	3	8

	examples and discussion				
Exams and Seminar Preparation	Lecture in person with examples and discussion	Studying the conditions and mechanics of arranging isoimides to the corresponding imide	Isoimide arrangement	3	9
Exams and Seminar Preparation	Lecture in person with examples and discussion	Preparation of dicyclic imides	Dicyclic imides	3	10
Exams and Seminar Preparation	Lecture in person with examples and discussion	Preparation, mechanics and reactions of dicyclic isoimides	Dicyclic isoimides	3	11
Exams and Seminar Preparation	Lecture in person with examples and discussion	Preparation of polyimides by condensation polymerization with examples	Preparation of condensation polyimides	3	12
Exams and Seminar Preparation	Lecture in person with examples and discussion	Preparation of polyimides by chain polymerization	Preparation of addition polyimides	3	13
Exams and Seminar Preparation	Lecture in person with examples and discussion	Study of polymerization of isoimides by different methods	Preparation of polyisoimides	3	14
Exams and Seminar Preparation	Lecture in person with examples and discussion	Study of different applications of polyimides and isoimides	Applications of polyimides and polyisoimides	3	15
Exams and Seminar Preparation	Lecture in person with examples and discussion	Study of addition and condensation polymerization And copolymerization	Study of the types of polymerization used in the preparation	3	16

1. Infrastructure	
	1. Required Textbooks
	2. Main References and Resources

Scientific journals (various local and international)	1(Books and references recommended) (scientific journals, reports, etc.)
	2(Electronic reference, websites, etc.)

12. Curriculum development plan	
During the lectures, questions are asked about some points and the student is assigned to them as a homework to be discussed in the next lecture, which increases the student's knowledge and benefit from the scientific discussion	The curriculum can be developed through:
. Students are assigned to prepare a seminar on selected topics so that the seminar includes what is mentioned in scientific magazines, books and electronic references, which contributes to the student's scientific enrichment.	

PhD/Second Course
Specialization: Organic Chemistry

Mechanism and Structure in Organic Chemistry

Course Description

Knowing the methods of preparation and comparing them and the possible resulting compounds, as well as studying the different types of compounds and studying the proposed mechanism for each .type of methods used to diagnose organic compounds

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Mechanism of Reactions in Organic Chemistry	3. Course name/code
Weekly	4. Available forms of attendance
Second Semester \2023-2024	5. Semester/year
45 Hours	6. Number of study hours (total)
2023\9\1	7. Date this description was prepared

8.Course objectives

The aim of teaching the subject of Structures and Mechanics in Organic Chemistry is to know the methods of preparation and comparison between them and the possible resulting compounds from .them

As well as studying the different types of compounds and studying the proposed mechanics for .each type

.Methods used to diagnose organic compounds

Course outcomes and teaching, learning and evaluation methods .9

.A- Cognitive objectives

A1- Identify the preparation of organic compounds

A2- Preparation mechanics

A3- The importance of compounds and their applications

:B- Program specific skill objectives

B1- Teaching the student to benefit from the Internet and external sources to extract research and reports on the subject

.B2- Solutions to external problems related to the topic

B3- Discussing students within the lecture and asking questions to expand the student's understanding

Teaching and learning methods

Approved books

Paper lectures

Basic scientific books

Modern scientific research

Evaluation methods

Short exams (oral and written) and continuous monthly exams Reports and research required from the student

:C-Emotional and value objectives

C1-Communication with students

C2-Achieving scientific thinking and deductive analysis of scientific information

Teaching and learning methods

.The lecture method and the use of the interactive board-1

.Explanation and clarification-2

Providing students with the basics and additional topics related to the outputs of thinking and -3 chemical analysis

Forming discussion groups during lectures to discuss chemistry topics that require thinking and -4 analysis

Asking students to ask a set of mental questions during lectures such as what, how, when and -5 why for specific topics

.Giving students homework that requires self-explanations in causal ways-6

Evaluation Methods

.Evaluation of student performance during the lecture-1

.Evaluation of student performance during field research as part of the practical evaluation-2

.Short exams during the semester-3

.Theoretical evaluation exam for the middle and end of the semester-4

.Comprehensive exam-5

.Scientific discussion of the doctoral student's thesis-6

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

D1- Conducting scientific debates with other universities

D2- Ability to work in government and private pathological analysis laboratories

D3- Ability to gain experience in collecting and analyzing scientific material and delivering
seminars

Course structure.10					
Evaluation Method	Teaching method	Unit name/topic	Required Learning Outcomes	hours	WEEK
Exams	Theoretical	Acids and bases	Scientific Analysis and Conclusion	3	1 st
Exams	Theoretical	Acids and bases	Scientific Analysis and Conclusion	3	2 nd
Exams	Theoretical	Further molecular rearrangements	Scientific Analysis and Conclusion	3	3 rd
Exams	Theoretical	Free radical reactions	Scientific Analysis and Conclusion	3	4 th
Exams	Theoretical	Free radical reactions	Scientific Analysis and Conclusion	3	5 th
Exams	Theoretical	Beta elimination reactions	Scientific Analysis and Conclusion	3	6 th
Exams	Theoretical	Beta elimination reactions	Scientific Analysis and Conclusion	3	7 th
Exams	Theoretical	Addition reactions	Scientific Analysis and Conclusion	3	8 th
Exams	Teaching method	Addition reactions	Scientific Analysis and Conclusion	3	9 th
Exams	Theoretical	Addition reactions	Scientific Analysis and Conclusion	3	10 th
Evaluation Method	Theoretical	Carbanions and enolization	Scientific Analysis and Conclusion	3	11 th
Exams	Theoretical	Carbanions and enolization	Scientific Analysis and Conclusion	3	12 th
Exams	Theoretical	Carbanions and enolization	Required Learning Outcomes	3	13 th
Exams	Theoretical	Carbanions and enolization	Scientific Analysis and Conclusion	3	14 th

11. Infrastructure	
	1- Required textbooks
Mechanism and structure in organic chemistry Edwin S .Gould	2- Main references (sources)

A Guide to the Mechanism of Organic Reactions Dr. Fadhel Suleiman Kamouna	3- Recommended books and references (science journals, reports, etc.)
	4- Electronic references, Internet sites
12. Curriculum development plan	
Updating the scientific material Using modern technologies	

PhD/Second Course
 Specialization: Organic Chemistry
Application of some reactions in natural products biosynthesis
Course Description

Teaching postgraduate students the basics and concepts of chemistry, natural products, studying the formation and mechanisms of their reactions in nature, the foundations and methods of their isolation, as well as studying the stereochemistry of natural product compounds.

University of Baghdad	1. Educational institution
College of Science / Department of Chemistry	2. Academic department/center
Application of some reactions in the biosynthesis of natural products	3. Course name/code
Weekly	4. Available forms of attendance
Second semester / 2023-2024	5. Semester/year
45 hours	6. Number of study hours (total)
2023\9\1	7. Date this description was prepared

Course objectives .8

Teaching postgraduate students the basics and concepts of chemistry, natural products, from studying the formation and mechanics of their reactions in nature, the foundations and methods of isolating them, as well as studying the stereochemistry of natural product 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 textbooks and assistance. With the presence of video lectures, the student lives in a traditional lecture environment and with the same discussion methods by asking questions and answering the professor to ensure the integration of the foundations of a successful lecture.

Course outcomes, teaching, learning and evaluation methods .9

.A- Cognitive objectives

A1- Reaching a good understanding of the academic content of the subject of organic chemistry

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

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

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

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

A6- Helping students take short exams outside the time allocated for the lecture

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:B- Program 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 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

:C-Emotional and value-based objectives

.C1- Enabling students to understand chemistry in all specializations

C2- Enabling students to solve problems related to the analysis, diagnosis and discrimination
.of chemical compounds

.C3- Enabling students to solve problems related to the intellectual framework of chemistry

.C4- Acquiring the skill of dealing ethically with participants in scientific research

C5- Creating scientific competencies characterized by professionalism, transparency, honesty
.and integrity

Teaching and learning methods

.Lecture method and use of interactive whiteboard -1

.Explanation and clarification -2

Providing students with the basics and additional topics related to the outputs of thinking -3
.and chemical analysis

Forming discussion groups during lectures to discuss chemistry topics that require thinking -4
.and analysis

Asking students a set of mental questions during lectures such as what, how, when and why -5
.for specific topics

.Giving students homework that requires self-explanations in causal ways -6

Evaluation methods

.Evaluating the student's performance during the lecture -1

Evaluating the student's performance during the field research as part of the practical -2
.evaluation

.Short exams during the semester -3

.Theoretical evaluation exam for the middle and end of the semester -4

.Comprehensive exam -5

.Scientific discussion of the doctoral student's thesis -6

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 learn about 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	Application of some reactions in the biosynthesis of natural products	Purification, isolation of natural products	6	1-2
Short exams, monthly exams and oral discussions	Electronic - Visual video lectures	Application of some reactions in the biosynthesis of natural products	Terpenes: sesquiterpenes	6	4-3
Short exams, monthly exams and oral discussions	Electronic - Visual video lectures	Application of some reactions in the biosynthesis of natural products	The construction mechanisms in natural products	6	6-5
Short exams, monthly exams and oral discussions	Electronic - Visual video lectures	Application of some reactions in the biosynthesis of natural products	Peptides, Proteins and other amino acids derivatives: Synthesis of α-Amino acids -Acylamidomalonic Ester synthesis -Amination of α-Halogenated Acids -Alberston method -Curtius reaction[Curtius Rearrangement] -Darapsky Synthesis -Erlnmeyer-Plöchl Azlactone and Amino acid synthesis -Gabriel phtalimide synthesis -Hofmann Degradation method -Hydantion synthesis -Malonic ester synthesis -Reduction of α-ketonic Acids -Strecker synthesis -Modified peptides:	6	8-7
Short exams, monthly exams and	Electronic - Visual video lectures	Application of some reactions in the	Alkaloids Definitions -Protoalkaloids	6	10-9

oral discussions		biosynthesis of natural products	-General methods of structure elucidation of alkaloids -Determination of molecular formula -Functional Group analysis: functional nature of O-ATOM, Alcoholic hydroxyl group, phenolic hydroxyl group, carboxylic group, lacton rings -Degradation of alkaloids -Von- Brauns method[or tertiary cyclic amines] -Constitution of Ricinine -Synthesis of Piperic acid by Perkin reaction, Claisen-Schmidt reactin		
Short exams, monthly exams and oral discussions	Electronic - Visual video lectures		Some Vitamins associated with the construction mechanisms: <i>Vitamin B1, Vitamin B2, Vitamin B5, Vitamin B6, Vitamin B12, Vitamin H</i>	6	12-11
		Semester Exams			14-13

11. Infrastructure	
Medicinal chemistry of natural products, Paul S.	1- Required textbooks
Comprehensive of natural products, Christenson J.	2- Main references (sources)
-Principles of organic chemistry, Salmon -Organic letters, UK reports	3- Recommended books and references (scientific journals, reports,)
https://ar.wikipedia.org/wiki/%D9%83%D9%8A%D9%85%D9%8A%D8%A7%D8	4- Electronic references, Internet sites

12. 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 (blended and electronic learning

(Research Methodology) Course Description / Scientific Research Methodology

This course description provides an identification of the most important vocabulary .required for scientific research

University of Baghdad / College of Science	1. Educational institution
Department of Chemistry	2. Department/university center
Scientific Research Methodology	3. Course name/code
Weekly	4. Available forms of assistance
Second Semester 2023-2024	5. Semester/year
1 hour = 15 x 30 hours	6. Number of hours of study (total)
2023\9\1	7. The date this description was prepared.
<p>8.. Course objectives It aims to teach the scientific research methodology subject, including reviewing scientific references and how to write a thesis and dissertation and publish scientific research in global .containers Learning outcomes, teaching and learning methods and evaluation .9 A- Cognitive objectives A1- Providing students with knowledge of the foundations of the scientific research methodology .subject A2- Acquiring knowledge of the correct application of the rules of publishing in global .containers B- Skill objectives .B1- Teaching the student how to extract sources</p>	

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 and creating paper lectures and -1
 .using power point technology to clarify solutions and applications

Continuously benefiting from the World Wide Web unit (Internet) by displaying videos related -2
 .to the topic

Evaluation methods

Conducting short surprise exams for each student to be aware and continuous reading of -1
 .lectures related to the scientific material

Conducting continuous monthly exams and evaluating the reports and research required from -2
 .the student

C- Emotional and value 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 graduate students and are
 committed to reading, attending lectures, conducting monthly and short exams, and abiding by
 .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

Academically distinguished students and participants in 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 students among them. D2- Developing personal skills by giving
 .poetry debates through their participation in central celebrations held within the university

Course structure .11

Evaluation Method	Teaching method	Name of unit/course or topic	Required learning outcomes	Hours	Week
Weekly Exams	Electronic screen	Research and researcher	The student will be able to know the basics of the scientific research methodology	1 hour	1st
Weekly Exams	Electronic screen	Hidden knowledges.facts	The student will be able to know the basics of the scientific research methodology and how to choose and prepare the research topic	1 hour	2nd
Weekly Exams	Electronic screen	Structure of a scientific paper	The student will be able to know the structure of the scientific article	1 hour	3rd
Weekly Exams	Electronic screen	Title (features of effective title, types of title)	The student will be able to know how to choose the appropriate title, abstract, introduction and conclusions when writing the research article	1 hour	4th
Weekly Exams	Electronic screen	Publication process	The student will be able to know the steps to publish the research article	1 hour	5th
Weekly Exams	Electronic screen	Important terminologies: Research originality	The student will be able to know some terms related to the basics of writing such as original research and valuable research	1 hour	6th
Weekly Exams	Electronic screen	Related work, literature review	How to choose the required sources when writing the first chapter and reviewing references	1 hour	7th
Monthly exam				1 hour	8th
Weekly Exams	Electronic screen	Reviewer's suggestion and editor decision	The student will be able to know how to evaluate research scientifically and whether it is suitable for publication or not and how to make a decision to accept or reject the research for publication	1 hour	9th
Weekly Exams	Electronic screen	Reviewing systems	The student will be able to know the electronic research evaluation system and the mechanism for selecting scientific evaluators and how to choose the appropriate journal for publication	Hours	10th
Weekly Exams	Electronic screen	Web of science, Thomson Reuters, and Scopus	The student will be able to identify some terms such as Scopus, Clarivate and Thomson Reuters	1 hour	11th
Weekly Exams	Electronic screen	Impact Factor and h-index	Explain the meaning of the impact factor and Hirsch factor	1 hour	12th
Weekly Exams	Electronic screen	Plagiarism	Scientific plagiarism and electronic plagiarism		13th
Weekly Exams	Electronic screen	Organization Ref. using ENDnote software	The student will be able to index and write sources using the ENDnote program		14th

Monthly exam		15th
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.12 Infrastructure	
-Sources Web of Science, www.ScienceDirect.Com, www.Scopus.com	Required readings: Basic texts Course books Other
There are websites that show explanatory videos on how to organize sources using	Special requirements (including, for example, (workshops, periodicals, software, and websites)