Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2026

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

University Name: Al-Muthanna University

Faculty/Institute:

Scientific Department:

Academic or Professional Program Name: Msc.– PhD. degree in Science

Final Certificate Name: Msc.- PhD Chemistry Science

Academic System: Semester (courses)

Description Preparation Date: October 2025

File Completion Date: 25/1/2026

Signature:

Head of Department

Dr.Azal Shaker Waheeb

Date:25/1/2026

Signature:

Assistant Dean for Scientific Affairs

and Graduate Studies

Dr.Salah A. Hassan

Date:25/1/2026

The file is checked by:

Department of Quality Assurance and University Performance

Date: / /2026

Signature:

Approval of the Dean

1. Program Vision

Preparing graduates in the field of chemistry to work in government departments and benefit from their specialization in the practical and applied field.

2. Program Mission

Working to prepare and graduate leading scientific and leadership competencies in the field of chemistry and in developing the knowledge base in the field of scientific research in the field of chemistry to serve the local, regional and international community, as well as training and refining the minds of students scientifically and intellectually, and emphasizing social and cultural values and responding to the requirements of the local market.

3. Program Objectives

1- Instilling and disseminating a spirit of knowledge through scientific research and other activities (seminars, workshops, conferences).
2- Preparing highly qualified scientific professionals holding advanced degrees (Master's and PhD) in various chemistry specializations.
3- Serving the community through scientific analysis of issues raised by public and private sector institutions, as well as establishing joint research projects with these institutions that contribute to increased production and quality.
4- Developing the department through openness and keeping pace with global advancements to enhance faculty efficiency and raise the academic level of students.
5- Preparing highly skilled and competent researchers in various chemistry specializations to supply universities, research and educational institutions, and other ministries with qualified scientific personnel who are up-to-date with global scientific progress.
6- Keeping pace with developments in curricula and fostering openness and communication with similar scientific institutions both within and outside the country, while keeping abreast of the era of technological advancement through modern electronic systems.
7- Contributing to the enrichment of human knowledge through specialized studies and rigorous scientific research to achieve innovative scientific and applied

contributions and uncover new facts.
8- Encouraging scientific talent to keep pace with the rapid advancement of science and technology, motivating them towards creativity and innovation, developing scientific research, and directing it to address societal needs and enhance the college's capacity for sustainable development and community service.
9- The Chemistry Department aims to be a model striving to achieve a solid scientific standard and prepare competent scientists who possess the scientific background and chemical or research skills necessary to practice their work safely and effectively, and who are prepared to keep pace with cognitive and technological advancements, pursue advanced degrees in various chemical specializations, and contribute to the development of future leaders.
10- Activating scientific research and creating a suitable environment for creativity and invention.
11- Providing a faculty of sufficient competence and numbers to fulfill the mission of the college and department.
12- Providing a supportive organizational and academic environment. Utilizing scientific research to serve the country's social and developmental issues.
13- Activating participation, coordination, and integration between the college, department, and the community through holding seminars, conferences, and workshops to discuss the country's health and scientific issues.
14- Contributing to the transfer and production of knowledge and the requirements for building the national science and technology system through active participation in local, regional, and international seminars, workshops, and conferences.
15- Strengthening the spirit of citizenship and belonging to the community and promoting ethical values and principles.

4. **Program Accreditation**
Does the program have program accreditation? And from which agency?

5. **Other external influences**

It contributes to solving many dilemmas related to mathematical studies . Through cooperation with other ministries such as the Ministry of Science, Technology, Industry and Minerals, and the Ministry of Health.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements				
College Requirements	**Yes**			
Department Requirements	**Yes**			
Other				

* This can include notes whether the course is basic or optional.

7.Program Description

الساعات المعتمدة		Course Code	اسم المقرر أو المساق	Year/Level
practical	Theoretical		Advanced Inorganic Chemistry	PhD
	2			
	2		Advanced Analytical Chemistry	
	2		Advanced Biochemistry	
	2		Advanced Physical Chemistry	
	2		Advanced Organic Chemistry	

8. Expected learning outcomes of the program

Knowledge

1- Enabling students to acquire knowledge and understanding of chemistry in all its sub-specialties. 2- Enabling students to acquire knowledge and understanding of practical experiments. 3- Striving to prepare scientists and researchers with scientific and laboratory skills of a research nature. 4- Providing educational programs that keep pace with technological development and conducting rigorous scientific research and studies.	

5- Interacting with scientific and technological experiments and experiences in a way that serves society. 6- Establishing research projects that provide solutions to societal problems. 7- Enabling students to acquire knowledge and understanding of the chemical structures of compounds. A3- Enabling students to acquire knowledge and understanding of the mechanisms of chemical reactions and methods of detection and diagnosis.	
Skills	
1- To equip students with the specific skills to identify societal problems, their causes, their distribution, and the impact of various factors, as well as to determine the most appropriate methods and means for solving these problems. 2 - To equip students with the fundamental skills for conducting various scientific studies. 3 - Graduates acquire the knowledge and research skills necessary for their academic and professional futures. 4 - Graduates of this program are prepared for either academic or practical careers in other ministries, both within and outside of higher education.	
Ethics	
The student is expected to have developed the following values: 1- Academic Honesty and Integrity: Adherence to the highest standards of scientific honesty in completing assignments and research projects, and the ability to conduct experiments in accordance with ethical, health, and occupational safety guidelines, and to respect intellectual property rights in the use of sources and references. 2- Teamwork, Collaboration, and Professional Responsibility: Appreciation of the importance of collaboration and working within multidisciplinary teams, while fostering teamwork and shared responsibility for achieving goals. Understanding the role and societal responsibility of chemistry in providing solutions to complex problems in society and industry, and	

adherence to professional ethical standards. 3- Lifelong Learning: Recognizing the importance of continuous learning and self-development in the field of chemistry and advanced technology to keep pace with ongoing developments in fields related to chemical sciences. 4- Commitment to Quality and Critical Thinking: Appreciation of the importance of producing high-quality work in both theoretical and practical applications, which promotes professional values in academic and professional work. Developing the ability to think independently and make decisions based on chemical analysis and practical data, while accepting constructive criticism and self-improvement.	

9.Teaching and Learning Strategies
1- Lecture method and use of the interactive whiteboard. 2- Explanation and clarification. 3- Providing students with the fundamentals and additional topics related to the outputs of chemical reasoning and analysis. 4- Forming discussion groups during lectures to discuss chemistry topics that require reasoning and analysis. 5- Asking students a set of critical thinking questions during lectures, such as what, how, when, and why, for specific topics. 6- Assigning homework that requires students to provide independent explanations using causal methods.

10. .Evaluation methods
1- Research Evaluation. 2- Theoretical Tests . 3- Reports and Studies. 4- Daily Self-Assessed Quizzes. 5- Graded Homework. 6- Final Exam. 7- Comprehensive Exam.

11.Faculty			
Faculty members			
Faculty preparation	**Special requirements/skills**	**Specialization**	**Academic rank**

		((if any				
Lecturer	**Appointed Angel**			**Private**	**General**	
	#			Physical Chemistry	Chemistry	Prof. Dr. Qasim Mohammed Helou
	#			Organic Chemistry	Chemistry	Prof. Dr. Riyadh Jalil Nahi
	#			Inorganic Chemistry	Chemistry	Prof. Dr. Azal Shakir Wahib
	#			Biochemistry	Chemistry	Assistant Professor Mona Hassoun Aboudi
	#			Analytical Chemistry	Chemistry	Assistant Professor Masar Ali Awad

Professional Development

Mentoring new faculty members

Briefly describe the process used to orient new, visiting, full-time, and part-time faculty members at the institutional and departmental levels. Workshops and Training Courses: Courses are organized on modern teaching methods, classroom management, and the use of educational technologies. Participation in Academic Seminars: New faculty members are encouraged to attend conferences and seminars to expand their knowledge and build academic networks.

Evaluation and Feedback: Regularly provide constructive feedback to improve academic performance. Promoting Academic Research and Publication: Supporting new faculty members in preparing and publishing their research and participating in research teams within the department or college. Participation in Committees: New faculty members are provided the opportunity to participate in departmental committees to enhance their understanding of administrative and academic systems.

Professional development of faculty members

Personal development is planned through reviewing modern scientific resources and participating in training courses both inside and outside the country in the field of scientific specialization. The Scientific Department pays special attention to the continuous professional development of faculty members, with the aim of enhancing their teaching and research competencies and keeping pace with academic developments. This includes: • Organizing advanced workshops and training courses in teaching methods, student assessment, and the use of modern educational technology.

• Encouraging scientific research and academic publishing by supporting participation in

conferences, scientific journals, and joint research projects. • Participating in quality and academic accreditation programs to raise awareness of educational standards and develop institutional performance. • Academic exchange and cooperation with other universities, both internally and externally, to exchange experiences and expand horizons of knowledge.

• Contributing to the development of curricula and courses to keep pace with scientific developments and labor market needs. • Self-evaluation and continuous feedback to identify strengths and opportunities for improvement in academic performance.

• Encouraging the use of innovative teaching methods such as active learning and project-based learning.

12. Acceptance Criterion

All applicants to the PhD program in various chemistry specializations must meet the admission requirements for graduate studies as stipulated in the university's admission policy, in addition to the following requirements for admission:

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

2- Passing the English, Arabic, and computer skills tests.

3- Completing the online application on the College of Science - University of Baghdad homepage during the admission period.

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

5- Admission will be based on competitive points.

6- Application procedures vary depending on the application channels (general and private admission).

7- Competition for specialization (inorganic chemistry, physical chemistry, biochemistry).

13. The most important sources of information about the program

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

Research and Development Department.

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

14. Program Development Plan

1. Using modern methods and modern books in the field of chemistry and using electronic devices to display information related to each element of the curriculum.

2- Twining with corresponding departments in Iraqi and international universities.

Program Skills Outline

r/Level	Course Code	Course Name	Basic or optional	Required program Learning outcomes										
				Knowledge				Skills				Ethics		
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C
stPhD.		Isomerism in Coordination Chemistry	(Basic)		√		√	√		√	√	√		√
		Advance Inorganic Chemistry	(Basic)	√		√			√		√		√	
tPhD.		Advance Organic Chemistry	(Basic)		√		√	√		√	√	√		√
		Advance Physical Chemistry	(Basic)		√		√	√		√	√	√		√
tPhD.		Advanced Analytical Chemistry	(Basic)	√		√			√		√		√	
		Advanced Biochemistry	(Basic)	√		√			√		√		√	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name: Advance Inorganic chemistry	
2. Course Code:	
3. Semester / Year: 2025-2026	
Semester / First	
4. Description Preparation Date: 3 / 9/2026	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
Number of study hours (2) / Number of units (2)	
7. Course administrator's name (mention all, if more than one name)	
Name: Azal Shakir Waheeb Email: azilshker@mu.edu.iq	
8. Course Objectives	
Course Objectives	Inorganic chemistry is not simply the study of elements and compounds; it is also the study of physical principles. For example, in order to understand why some compoun are soluble in a given solvent and others are not, we apply laws of thermodynamics. our aim is to propose details of a reaction mechanism, then a knowledge of reaction kinetics is needed. To interpret the behaviour of molecules in solution, we use physic techniques such as nuclear magnetic resonance (NMR) spectroscopy; the equivalenc or not of particular nuclei on a spectroscopic timescale may indicate whether a molecule is static or undergoing a dynamic process. There are two limiting mechanisms for substitution reactions of coordination complexes, associative, whicl corresponds to the SN2 reaction in organic chemistry, and dissociative, which corresponds to the SN1 reaction in organic chemistry.
9. Teaching and learning strategies	
Strategy	1. Direct instruction. 2. Brainstorming (stimulating questions). 3. Self-directed learning (report writing). 4. Unscheduled learning (assignments).

10.Course Description FormCourse Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	metho
Week 1	2		Isomerism in Coordination Chemistry	Using display devices (smart screens) Lecture + PowerPoint	Daily and monthly theoretical and practical exams + student reports and activities Daily and monthly theoretical and practical exams + student reports and activities
Week 2	2		Solvent & Hydrate Isomerism		
Week 3	2		Hard and soft acid base		
Week 4	2		Application of Hard \Soft theory		
Week 5	2		Substitution Reaction of Octahedral Complexes		
Week 6	2		Stereochemistry of substitution		
Week 7	2		Substitution Reaction of Square Planar Complexes		
Week 8	2		Principal mechanisms of ligand exchange in octahedral complexes		
Week 9	2		Catalyzed substitution reactions		
Week 10	2		Stereochemistry of base hydrolysis reactions		
Week 11	2		Complexation of metal ions with sulfer, nitrogen and oxygen doner atom ligand		
Week 12	2		The factor affecting σ – donor strength of ligands		
Week 13	2		Factor effecting the value of Δ		
Week 14	2		Magnetic susceptibility of complexes		
Week 15	2		Preparation of carbonyl complexes either directly with CO or indirectly		

11. Course evaluation

1- Monthly tests
2 - Daily tests and discussions
3 - Reports and homework
4 - Questions, answers, and discussions during lectures
5 - 40% of the coursework grade is distributed according to the student's assigned tasks, such as daily preparation, daily, oral, monthly, and written exams, and reports. 60% of the final exam grade is for the final exam.

12. References

1- James E. HuHeey : Inorganic chemistry
2- CATHERINE E. HOUSECROFT AND ALAN G. SHARPE : Inorganic Chemistry

4. Recommended supporting books and references (scientific journals, reports...)

1- Synthesis, and characterization of Ni(II), and Cu(II) metal complexes containing n azo dye ligand (N,N,N) and evaluation of their biological activities supported by D studies, molecular docking, ADMET profiling, drug-likeness analysis and toxic prediction.
2- Ni(II) and Cu(II) Complexes With a Tridentate (O,N,O) Azo Dye Antipyrine-Based Ligand: Synthesis, Spectral Characterization, Cytotoxicity, and In Silico Approaches.
3- Evaluating the electronic and structural basis of carbon selenide-based quantum dots as photovoltaic design materials: A DFT and ML analysis.
4- Chemical modification-induced enhancements in quantum dot photovoltaics: theoretical and molecular descriptive analysis .
5- Exploring New Azobenzene Type Photoswitches by Machine Learning with Low Possible Fluorescence Excitons with Ease of Synthesis.
6- Spectroscopic, characterization and bioactivity studies of new Ni (II), Cu (II) and Ag complexes with didentate (N,N) donar azo dye ligand.
7- Metal complexes of a new azo ligand 2-[2′-(5-nitrothiazolyl) azo]-4-methoxyphe (NTAMP): Synthesis, spectral characterization, and theoretical calculation .
8- Preparation, Spectral Characterization, Antimicrobial and Cytotoxic Studies of so Transition Metal Nanocomplexes of a Novel Azo Derivative Formed from 2-Amino Methylthiazol .
9- Synthesis, characterization, biological activity, and modelling protein docking divalent, trivalent, and tetravalent metal ion complexes of new azo dye ligand (N,N, derived from benzoimidazole.
10- Smart design of phenanthrene-based organic photovoltaics using machine learning .

11- Curating Benzothiophene Experimental Absorption and Emission Spectra to Desi Fluorescent Organic Polymer Chemical Space: A Machine Learning Quest.

12- Theoretical Design of Asymmetrical 5,10-Diphenyl-5, 10-Dihydrophenazine Donc π–Acceptor Chromophores for Photovoltaic Applications.

13- RETRACTED ARTICLE: Cancer stages and demographical study of HPV16 in ge L2 isolated from cervical cancer in Dhi-Qar province, Iraq.

14- Synthesis, characterization and antimicrobial activity studies of new heterocyclic a dye derived from 2-amino- 4,5- dimethyl thiazole with some metal ions.

15- Recent advances in the synthesis of zirconium complexes and their cataly applications.

16- Synthesis, spectral characterization, lethal dose (LD50) and acute toxicity studies 1,4-Bis(imidazolylazo)benzene (BIAB).

17- Preparation, Spectral Characterization, Antimicrobial and Cytotoxic Studies of so Transition Metal Nanocomplexes of a Novel Azo Derivative Formed from 2-Amino Methylthiazol.

18- Accelerated discovery of new organic photovoltaic dyes for OPVs using lig absorbance as the primary screening criterion via machine learning and DFT.

19-Integrating computational chemistry and machine learning for the stability predicti of transition metal ternary compounds .

20- Screening thiophene based organic spacers for their low lying LUMO energies photovoltaic dye materials: a Gaussian process ML based analysis.

Course Description Form

1.Course Name: Advanced Analytical Chemistry
2.Course Code:
3.Semester / Year: 2025-2026
Semester / First
4.Description Preparation Date: 3 / 9/2026
5.Available Attendance Forms:
6.Number of Credit Hours (Total) / Number of Units (Total)
Number of study hours (2) / Number of units (2)
7.Course administrator's name (mention all, if more than one name)
Name: Masar Ali Awad Email: masarali@mu.edu.iq
8.Course Objectives

Course Objectives	Introducing the student to the basic concepts in analytical chemistry

9. Teaching and learning strategies	
Strategy	1. Direct instruction. 2. Brainstorming (stimulating questions). 3. Self-directed learning (report writing). 4. Unscheduled learning (assignments).

10.Course Description Form Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	method
Week 1	2		**Advanced General introduction - its types, a historical overview**	Using display devices (smart screens) Lecture + PowerPoint	Discussion + Homework My Homework Daily and monthly theoretical and practical exams + student reports and activities
Week 2	2		Solvent & Hydrate Isomerism		
Week 3	2		**Advanced Equilibrium in chemical systems,**		
Week 4	2		**Advanced General introduction Advanced Modern Extraction**		
Week 5	2		**Advanced Supercritical Fluid Extraction (SFE)**		
Week 6	2		**Advanced Microwave-Assisted Extraction (MAE**		
Week 7	2		**Advanced Deep Eutectic Solvents (DES) and Natural Deep Eutectic Solvents (NADES)**		
Week 8	2		**Advanced Ultrasound-Assisted Extraction (UAE**		
Week 9	2		**Advanced Flow Injection Analysis part 1 Automated Flow Injection Techniques in Pharmaceutical Analysis**		
Week 10	2		**Advanced Nano fluidics for Flow Analysis part 2 Flow Injection Analysis in Industrial Biotechnology**		
Week 11	2		**Advanced to Mass Spectrometry The Principle, Types, and Applications**		
Week 12	2		The factor affecting σ – donor strength of ligands		
Week 13	2		**Advanced Inductivity Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES)**		
Week 14	2		Magnetic susceptibility of complexes		
Week 15	2		**High Performance Capillary Electrophoresis: Principles And Applications**		

11. Course evaluation

1- Monthly tests

2 - Daily tests and discussions

3 - Reports and homework

4 - Questions, answers, and discussions during lectures

5 - 40% of the coursework grade is distributed according to the student's assigned

tasks, such as daily preparation, daily, oral, monthly, and written exams, and reports. 60% of the final exam grade is for the final exam.

12. References

1)Gary D.Chritian,Analytical Chemistry,fifth editionjohn Willy & sons,inc, 1986.
2) Modern of Analytical Chemistry, Daived 2000

4. Recommended supporting books and references (scientific journals, reports...)

1- Synthesis, and characterization of Ni(II), and Cu(II) metal complexes containing new azo dye ligand (N,N,N) and evaluation of their biological activities supported by DFT studies, molecular docking, ADMET profiling, drug-likeness analysis and toxicity prediction.
2- Evaluating the electronic and structural basis of carbon selenide-based quantum dots as photovoltaic design materials: A DFT and ML analysis.
3- Curating Benzothiophene Experimental Absorption and Emission Spectra to Design Fluorescent Organic Polymer Chemical Space: A Machine Learning Quest
4- Preparation, Spectral Characterization, Antimicrobial and Cytotoxic Studies of some Transition Metal Nanocomplexes of a Novel Azo Derivative Formed from 2-Amino -5-Methylthiazol .
5- Molecular engineering on tyrian puprle natural dye as TiO2 based fined tuned photovoltaic dye material: DFT molecular analysis.
6- A machine learning and DFT assisted analysis of benzodithiophene based organic dyes for possible photovoltaic applications.-

Course Description Form

1.Course Name: Advanced Biochemistry	
2.Course Code:	
3.Semester / Year: 2025-2026	
Semester / First	
4.Description Preparation Date: 3 / 9/2026	
5.Available Attendance Forms:	
6.Number of Credit Hours (Total) / Number of Units (Total)	
Number of study hours (2) / Number of units (2)	
7.Course administrator's name (mention all, if more than one name)	
Name: Muna Hasson Email: Muna.hasson@mu.edu.iq	
8.Course Objectives	
Course Objectives	Introductions to the major concepts of clinical biochemistry and the medici plants as well as study of advanced kinetic enzymes . This course is designed provide an introduction to the relationship between biochemistry and fo nutrition ,biophysical ,environmental chemistry . Special attention is paid biochemistry in the context of techiques used for separation proteins and otl biomolecules . This course is especially applicable for students wishing improve their skills in advanced researches in Biochemistry.
9.Teaching and learning strategies	
Strategy	1. Direct instruction. 2. Brainstorming (stimulating questions). 3. Self-directed learning (report writing). 4. Unscheduled learning (assignments).

10.Course Description FormCourse Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	metho
Week 1	2		Advance in molecular Biology	Using display devices (smart screens) Lecture + PowerPoint	Daily and monthly theoretical and practical exams + student reports and activities Daily and monthly theoretical and practical exams + student reports and activities
Week 2	2		Advances in Biotechnology		
Week 3	2		Advanced Bioinformatics		
Week 4	2		Advances in Enzymology		
Week 5	2		Advances in Clinical Biochemistry		
Week 6	2		Biochemistry of Natural Products		
Week 7	2		Biochemistry of metabolic disorders		
Week 8	2		Metabolites of Plants		
Week 9	2		Advance in Molecular genetics		
Week 10	2		Protein structure, function and engineering		
Week 11	2		Biopolymers		
Week 12	2		Biophysical Chemistry		
Week 13	2		Food biochemistry		
Week 14	2		Energy nutrition		
Week 15	2		Advanced research in Biochemistry		

11. Course evaluation

1- Monthly tests
2 - Daily tests and discussions
3 - Reports and homework
4 - Questions, answers, and discussions during lectures
5 - 40% of the coursework grade is distributed according to the student's assigned tasks, such as daily preparation, daily, oral, monthly, and written exams, and reports.
60% of the final exam grade is for the final exam.

12.References

Enzymes: Biochemistry, Biotechnology and Clinical Chemistry by Trevor Palmer, Publisher; Horwood Publishing Limited (2004) Nelson, D. C. andCox, M.M., Lehninger Principles of Biochemistry, 5th Edition,W. H. Freeman, 2010. David Freifelder, Physical Biochemistry, 2nd edition, John Wiley and Sons 2005.

4. Recommended supporting books and references (scientific journals, reports...)

Course Description Form

1.Course Name: Advance in Physical Chemistry	
2.Course Code:	
3.Semester / Year: 2025-2026	
Semester / First	
4.Description Preparation Date: 3 / 9/2026	
5.Available Attendance Forms:	
6.Number of Credit Hours (Total) / Number of Units (Total)	
Number of study hours (2) / Number of units (2)	
7.Course administrator's name (mention all, if more than one name)	
Name: Kasim M. Hello Email: kasimhello@mu.edu.iq	
8.Course Objectives	
Course Objectives	Advancements in Physical Chemistry involve a deep dive into complex top such as surface chemistry, electrochemistry, and the properties of solids, liqui and gases, with an emphasis on heoretical approaches to understand mod chemical phenomena.
9. Teaching and Learning	
Strategy	1. Direct instruction. 2. Brainstorming (stimulating questions). 3. Self-directed learning (report writing). 4. Unscheduled learning (assignments).

10. Course Description Form Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	metho
Week 1	2		Introduction to Nano Technology in physical chemistry	Using display devices (smart screens) Lecture + PowerPoint	Daily and monthly theoretical and practical exams + student reports and activities Daily and monthly theoretical and practical exams + student reports and activities
Week 2	2		Thermodynamics of Surfaces; Equilibrium Crystal Shape		
Week 3	2		Basic Principles of UHV Additional reference: LBVT		
Week 4	2		Adsorption, desorption, diffusion (continued)		
Week 5	2		Nucleation and growth of thin films and nanostructures.		
Week 6	2		XPS (Part 2) and related electron spectroscopies.		
Week 7	2		Download: Introduction		
Week 8	2		Thermodynamics of Surfaces		
Week 9	2		X-ray Photoemission Spectroscopy (XPS).		
Week 10	2		Equilibrium Crystal Shape		
Week 11	2		Electron Diffraction and Microscopy.		
Week 12	2		Submit your topic of preference for Presentation		
Week 13	2		Quantitative Description of Surface Structure		
Week 14	2		Nucleation and growth of thin films and nanostructures.		
Week 15	2		Basic Principles of UHV		

11. Course evaluation

1- Monthly tests

2 - Daily tests and discussions 3 - Reports and homework 4 - Questions, answers, and discussions during lectures 5 - 40% of the coursework grade is distributed according to the student's assigned tasks, such as daily preparation, daily, oral, monthly, and written exams, and reports. 60% of the final exam grade is for the final exam.
12.References
1- Advanced Series in Physical Chemistry by Cheuk-Yiu Ng (University of California at Davis, USA)
4. Recommended supporting books and references (scientific journals, reports...)

Course Description Form

1.Course Name: Advance Organic Chemistry	
2.Course Code:	
3.Semester / Year: 2025-2026	
Semester / First	
4.Description Preparation Date: 3/ 9/2025	
5.Available Attendance Forms:	
6.Number of Credit Hours (Total) / Number of Units (Total)	
Number of study hours (2) / Number of units (2)	
7.Course administrator's name (mention all, if more than one name)	
Name: Riyadh Jaleel Nahi (Ph.D.) Email: riyadhnahi@mu.edu.iq	
8. Course Objectives	
Course Objectives	This course objectives To: 1- Understand the basic principles of reaction intermediates and types of intermediates and different methods of reaction mechanism 2- Provide the advance knowledge of organic synthesis in general and classical and modern reactions and methods in synthesis in particular. 3- Course provides the advanced NMR techniques
9.Teaching and Learning	
Strategy	1. Direct instruction. 2. Brainstorming (stimulating questions). 3. Self-directed learning (report writing). 4. Unscheduled learning (assignments).

10.Course Description FormCourse Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	metho
Week 1	2		Basic Principles of Organic Chemistry: Introduction to organic chemistry: Chemical bonding and molecular structure.	Using display devices (smart screens) Lecture + PowerPoint	Daily and monthly theoretical and practical exams + student reports and activities Daily and monthly theoretical and practical exams + student reports and activities
Week 2	2		**Reactive intermediates:** carbocations and carbanions; generation, structure, stability and reactivity		
Week 3	2		**Reactive intermediates:** free radicals, carbenes and nitrenes; Generation, structure, stability and reactivity of.		
Week 4	2		**Reactive intermediates:** Generation and reactivity of arynes, nucleophilic aromatic substitution reactions, SNAr mechanism; Ipso effect.		
Week 5	2		**Condensation reactions:** Aldol condensation; Canizzaro reaction; Dieckmann condensation; Benzoin condensation; Reformatsky reaction; Knoevenegal condensation		
Week 6	2		**Malonic Synthesis:** General introduction, Reaction Mechanism and examples		
Week 7	2		**Suzuki Coupling:** General introduction, Reaction mechanism and examples.		
Week 8	2		**Mannich Reaction:** General introduction, Reaction Mechanism and applications		

Week 9	2		**Arndt-Eistert Reaction**: General introduction, Reaction Mechanism and applications and examples		
Week 10	2		**Michael Reaction:** General introduction, Reaction Mechanism and applications and examples		
Week 11	2		**Mitsunobu Reaction**: General introduction, Reaction Mechanism and applications and examples		
Week 12	2		**Two-dimensional nuclear magnetic resonance spectroscopy:** Basic principles of two-dimensional (2D) NMR spectroscopy, 2D line shapes phases and filtering.		
Week 13	2		Resolved 2D spectroscopy Correlated 2D experiments (COSY, TOCSY) involving homo-nuclear and heteronuclear correlations.		
Week 14	2		**DEPT ^{13}C NMR Spectroscopy:** Introduction, Fundamental concepts and Interpreting DEPT Spectra		
Week 15	2		Review		

11. Course evaluation

1- Monthly tests

2 - Daily tests and discussions

3 - Reports and homework

4 - Questions, answers, and discussions during lectures

5 - 40% of the coursework grade is distributed according to the student's assigned tasks, such as daily preparation, daily, oral, monthly, and written exams, and reports.

60% of the final exam grade is for the final exam.

12.References

1- Molecular Orbitals and Organic Chemical Reactions. Ian Fleming, 2009, Wiley-Interscience publication, Great Britain.

2- Organic Chemistry. J. Clayden, N. Greeves, S. Warren, P. Wothers. Reino Unido: Oxford University Press, 2001

4. Recommended supporting books and references (scientific journals, reports...)

1- In Vitro, Evaluation of Antioxidant and Antibacterial Activities of New 1,2,3-Triaz Derivatives containing 1,2,4-Triaozle Ring
2- Synthesis and molecular docking studies of new pyrimidinone ring containing 1, 2, triazole derivatives.
3- Combination of 1, 2, 3-triazole, furan and thiazolidin-4-one structures for poten pharmaceutical applications
4- Synthesis and antioxidant study of new1, 3-oxazepin-4, 7-dione and1, 2, 3-triazole derivatives
5- Computational details of molecular structure, spectroscopic properties, DFT calculatic and molecular docking study of some 1, 4-disubstituted-1, 2, 3-triazoles
6- Synthesis, characterization and thermal stability study of new heterocyclic compoun containing 1, 2, 3-triazole and 1, 3, 4-thiadiazole rings
7- Design, synthesis and evaluation in vitro antibacterial activity of new 1, 2, 3-triaz derivatives
8- Synthesis and anti-diabetic activity evaluation of new 1, 2, 3-triazole derivativ incorporating 2-pyrazoline ring
9- Synthesis, Characterization and Thermal Behavior Study of New 1, 2, 3-Triaz Derivatives Containing 1, 3, 4-Oxadiazole Ring
10- Combination and Molecular Docking Studies of 1, 2, 3-Triazole and Pyrimidin-2-thio Rings for Potential Anti-COVID-19 Activity
11- Synthesis and In Vitro Antioxidant Activity Study of Some New Azoles Derivatives Sulfa Drugs
12- Design, synthesis and molecular docking analysis of new 1, 2, 3-triazole derivatives potential anti-breast cancer activity
13- Synthesis, In Vitro Anticancer Activity Study of Some New Antipyrine Derivativ Containing Thiazolidin-4-One Ring
14- Synthesis and Molecular Docking Study of New Heterocyclic Compounds Based Sulfanilic Acid for Potential Pharmaceutical Applications