Academic Program Description Form

University Name: Tikrit University

Faculty/Institute: College of Education for Girls

Scientific Department: Department of Chemistry

Academic or Professional Program Name: Doctor of Philosophy in Chemistry

Final Certificate Name: Doctor of Philosophy in Chemistry

Academic System: Annual/Courses

Description Preparation Date: 18/9/2025

Signature:

Department Head's Name:
Dr. Ban Dawood Saleh
Date: 7/10/2025

Signature:

Scientific Assistant's Name:
Dr. Ashraf Gamal Mahmoud
Date: 7/10/2025

جامعة تكريت
شعبة ضمان الجودة والاداء الجامعي
كلية التربية للبنات

Review the file by:
Quality Assurance and University Performance Department
Name of the Director of the Quality Assurance and University Performance:
Department:
Date: 7/10/2025
Signature:

Approval of the Dean
Date: 7/10/2025

1. Program Vision

1- Leadership and innovation in the field of conducting scientific experiments.
2- Elevating the level of the laboratory according to the needs of the students.
3- Equipping students with the theoretical and applied foundations and information in the field of chemistry and making them competent and capable of offering their expertise to serve the community.

2. Program Mission

1- Providing academic education and practical training in the field of scientific laboratories and equipping students with practical skills in line with international standards.
2- Elevating the level of the department according to the needs of the students.
3- Preparing a conscious generation of students who possess scientific and practical experience in the field of chemistry.
4- Training and preparing students on how to avoid risks to ensure chemical safety and security within the laboratory.

3. Program Objectives

1- Qualifying students technically and academically in the practical field and applications of chemistry laboratories.
2- Preparing students and establishing the foundations of chemistry for them.
3- Opening future prospects and attracting students towards the scientific and practical aspects in a better way.
4- Guiding students towards engaging with environmental problems around them and finding solutions to serve the community.
5- Playing an active and influential role in the fields of analysis and quality control.
6- Preparing a generation of qualified and competent teachers to join the education sector.

4. Program Accreditation

Is the program accredited? From which authority? No.

5. Other external influences

The School Application - Laboratory Practical Training
Theoretical and Practical Graduation Research Projects

6.Program Structure

Program Structure	Number of Courses	A study unit	Percentage	Notes
Enterprise Requirements				
College Requirements				
Department Requirements				
Summer Training				
Others				

* Can include notes on whether the course is required or elective.

7.Program Description

The year / level	Course code or course title	Course name or subject	Approved hours	
2026-2025 M.Sc. / First Semester		Advanced Organic Chemistry	**2**	
		Advanced Analytical Chemistry	**2**	
		Advanced Biochemistry	**2**	
		Advanced Inorganic Chemistry	**2**	
		Advanced Physical Chemistry	**2**	
		English Language	**1**	
		Research Methodology	**1**	

8.Expected learning outcomes of the program

Knowledge

1Learning Outcomes Cognitive Objectives **1-** Empowering students to acquire knowledge and overall intellectual understanding of chemistry. **2-** Empowering students to acquire knowledge and understanding of the laws of chemistry. **3-** Empowering students to acquire knowledge and understanding of chemistry in English. **4-** Empowering students to acquire	**1**Learning Outcomes Statement **1-** Empowering students to acquire knowledge of the basic principles of chemistry. **2-** Providing students with knowledge through homework assignments of study vocabulary.

knowledge and understanding of chemical analysis standards.	
Skills	
2 Learning Outcomes General Skills: **1-** Communication and Information Technology skills and developing strategies for teamwork. **2-** Proficiency in modern communication techniques, documentation, and communication with institutions and scientific centers. **3-** Possessing language skills (fluency in speaking, writing, and understanding Arabic and English) in the art of listening, persuasion, and dialogue. **4-** Problem-solving skills in education using educational and psychological programs and methods. **5-** Possessing leadership qualities, memory power, intuitive speed, and the ability to predict and infer	**2-**Statement of Learning Outcomes Empowering students to solve problems that are relevant to their learning style in the lesson.
3- Learning Outcomes Skills Objectives: **1 -** Scientific and practical skills. **2 -** Remembering and analytical skills. **3 -** Utilization and development skills.	**3-** Statement of Learning Outcomes Empowering students to solve problems related to teaching steps and employ the appropriate method.
The values	
Learning outcomes 4/ Daily and monthly exams	Learning outcomes statement 4/ Final exams
Learning outcomes 5/ Competitive grades for daily participation in the lesson	Learning outcomes statement 5/ Attendance and regularity grades in lectures
9. Teaching and Learning Strategies	
Providing students with the basics and topics related to knowledge and systems explained in: **1-** Clarifying and explaining the study materials by the academic staff through the whiteboard and Data Show. **2-** Providing students with knowledge through homework for study vocabulary. **3-** Encouraging students to visit the library to obtain academic knowledge related to study vocabulary.	

4- Improving students' skills by visiting electronic sites to obtain additional knowledge for study materials.

10. Evaluation methods

1- Daily tests with multiple-choice questions for academic subjects.
2- Grades are assigned for challenging competitive questions for students.
3- Grades are assigned for assigned homework.
4- Quality and quantity practical tests in laboratories.
5- Assigning students to conduct scientific seminars and discuss them.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)	Number of the teaching staff	
	General	Special		Staff	Lecturer
Professor	Organic Chemistry	Organic Chemistry	.	1	
Professor	Analytical Chemistry	Analytical Chemistry		1	
Professor	Biochemistry	Biochemistry		1	
Professor	English Language	English Language		1	
Assistant Professor	Physical Chemistry	Physical Chemistry		2	
Assistant Lecturer	Inorganic Chemistry	Inorganic Chemistry		1	
Assistant Lecturer	Analytical Chemistry	Analytical Chemistry		1	

12.Acceptance Criterion

1- Acceptance based on the overall and central grade system.
2- Acceptance in departments based on student's preference and grade.
3- Condition that the student must be a graduate of preparatory study and scientific branch only.
4- The accepted student must have sound personal and mental health and be free from physical disabilities.
5- The capacity of the college's departments to accommodate students.

13. The most important sources of information about the program

1- The curriculum approved by the Ministry of Higher Education and Scientific Research and its guiding references.
2- Courses and recommendations from scientific committees at the university.
3- Courses in teaching methods.

4- Training courses organized by the college on e-learning platforms.

Program Skills Outline

5- Internet research for similar experiments.

6- Personal experiences.

14. Program Development Plan

1- Development of the curriculum through deletion, addition, and replacement.

2- Use of modern teaching methods according to the nature of the subject and the level of learners from time to time.

3- Use of modern evaluation methods such as alternative and electronic assessment.

Program Skills Outline

Required program Learning outcomes

Year/ Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
2025 2026/			Mandatory	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
		Advanced Organic Chemistry	Basic												
		Advanced Analytical Chemistry	Basic												
		Advanced Biochemistry	Basic												
		Advanced Inorganic Chemistry	Basic												
		Advanced Physical Chemistry	Basic												
		English Language	Basic												
		Research Methodology	Basic												

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

Course Description Form

1. Course Name:	
Scientific research method / PhD level	
2. Course Code:	
3. Semester / Year:	
Semester / 2025-2026	
4. Description Preparation Date:	
18/9/2025	
5. Available Attendance Forms:	
Class attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 hours per Semester / 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name: **Ass. Prof. Saddam Mohammed Ahmed Al-Mahmoud** Email: **s_almahmoud@tu.edu.iq**	
8. Course objectives	
Course objectives	• Developing students' ability by identifying the most important scientific concepts and rules that must be followed by students to complete scientific research. • Encourage students to obtain knowledge, information and the ability to draw conclusions. • Preparing students to practice the teaching career and knowing how to write scientific research.
9. Teaching and Learning Strategies	
Strategy	1- Standard method (lectures). 2- Discussion and Questioning method. 3- Problem solving method. 4- Brainstorming method.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
Sep. 1	2		**The origin and development of science**	Standard and practical method	Class performance and exams
Sep. 2	2		**Types of scientific research**	Standard and practical method	Class performance and exams
Sep. 3	2		**Preparing the research plan**	Standard and practical method	Class performance and exams
Sep. 4	2		**Scientific research methods and tools**	Standard and practical method	Class performance and exams
Oct. 1	2		**The main requirements for carrying out research**	Standard and practical method	Class performance and exams
Oct. 2	2		**Information sources**	Standard and practical method	Class performance and exams
Oct. 3	2		**Writing style and general appearance**	Standard and practical method	Class performance and exams
Oct. 4	2		**Main paragraphs in scientific research**	Standard and practical method	Class performance and exams
Nov. 1	2		**The abstract**	Standard and practical method	Class performance and exams
Nov. 2	2		**The introduction**	Standard and practical method	Class performance and exams
Nov. 3	2		**Materials and methods**	Standard and practical method	Class performance and exams
Nov. 4	2		**The results**	Standard and practical method	Class performance and exams
Des. 1	2		**The discussion**	Standard and practical method	Class performance and exams
Des. 2	2		**References**	Standard and practical method	Class performance and exams
Des. 3	2		**The final design of the research**	Standard and practical method	Class performance and exams

11. Course Evaluation
1- Formative evaluation through daily exams, observing the student's performance in class discussions and homework assignments, and classroom evaluation. This grade does not exceed 20% of the total. 2- Diagnostic evaluation by semester and final exams to issue judgments of success and failure. This grade is 80% and is divided into (2) exams during the semester, to extract the quest before entering the final exams.

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	**"Scientific research methodology"**, Written by Muthanna Abdel Razzaq Al-Omar, Baghdad, college of Education for Girls, 2001.
Main references (sources)	
Recommended books and references (scientific journals, reports …)	Access to everything that is current and published in peer-reviewed scientific journals
Electronic References, Websites	https://scholar.google.com/ https://www.sciencedirect.com/ https://www.researchgate.net/

Course Description Form

1. Course Name:
Advance Biochemistry / PHD
2. Course Code:
3. Semester / Year:
Semester
4. Description Preparation Date:
18/9/2025
5. Available Attendance Forms:
Lectures in person presence with electronic classes (Classroom)
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours/2 units
7. Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Asmaa Hashim Shaker** Email : **dr.asmaa@tu.edu.iq**
8. Course Objectives

Course Objectives 1- Developing students' ability to follow and understand the conversation and developing their ability to distinguish between main and secondary ideas. 2- Urging students to obtain knowledge, information and the ability to draw conclusions. 3- Developing their abilities to make quick and comprehensive summaries of aspects of the topic.	

9. Teaching and Learning Strategies

Strategy	Strategy can be defined as a set of general rules and broad lines that concern the means of achieving the desired goals of teaching and indicate the methods and plans followed by faculty members to reach the learning goals.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

Sept. 1	2	Method of presentation and method of discussion	carbohydrates	The standard method, the practical method	Class performance and exams
sept. 2	2	Method of presentation and method of discussion	Glycolysis Pathway	The standard method, the practical method	Class performance and exams
sept. 3	2	Method of presentation and method of discussion	Pentose Phosphate Pathway	The standard method, the practical method	Class performance and exams
sept. 4	2	Method of presentation and method of discussion	Glyoxylate Pathway	The standard method, the practical method	Class performance and exams
Oct. 1	2	Method of presentation and method of discussion	Glycogen Storage Diseases	The standard method, the practical method	Class performance and exams
OCT.2	2	Method of presentation and method of discussion	Lipid Metabolism	The standard way, the practical way	Class performance and exams
Oct.3	2	Method of presentation and method of discussion	Beta-Oxidation	The standard method , the practical method	Class performance and exams
Oct.4	2	Method of presentation and method of discussion	Cholesterol Synthesis	The standard method , the practical method	Class performance and exams
Nov. 1	2	Method of presentation and method of discussion	Lipid Metabolic Diseases	The standard method, the practical method	Class performance and exams
Nov. 2	2	Method of presentation and method of discussion	Amino Acid Metabolism	Standard method	Class performance and exams
Nov. 3	2	Method of presentation and method of discussion	Exam	Standard method	Class performance and exams
Nov. 4	2	Method of presentation and method of discussion	Nucleic Acid Metabolism	Standard method	Class performance and exams

Dec. 1	2	Method of presentation and method of discussion	Diseases Related to Nucleic Acid Deficiencies	Standard method	Class performance and exams
Dec. 2	2	Method of presentation and method of discussion	Final Exams	Standard method	Class performance and exams
Dec. 3	2	Method of presentation and method of discussion	Final Exams	Standard method	Class performance and exams
Dec 4			Final Exams		

11. Course Evaluation
Distributing the score out of 100 according to the tasks assigned to the student such as daily etc..... preparation, daily oral, monthly, or written exams, reports

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Main references(sources):

- Biochemistry by Qusay Chalabi

- The central library at the university, and the college library

- International Information Network (Internet)

- The prescribed curriculum for study according to the vocabulary approved by the Ministry

See help resources

Course Description Form

1. Course Name:	
Physical chemistry / Study Ph.D	
2. Course Code:	
3. Semester / Year:	
Semester / 2025-2026	
4. Description Preparation Date:	
18/9/2025	
5. Available Attendance Forms:	
Class attendance + electronic classes (Google Classroom), which will be a supporting class for the in-person class, and according to the conditions and instructions of the Ministry of Higher Education and Scientific Research.	
6. Number of Credit Hours (Total) / Number of Units (Total)	
180 hours per year / 9 units	
7. Course administrator's name (mention all, if more than one name)	
Name: **Ass. Ph.D Atallah burhis dahkeel** Email: **atallah.b@tu.edu.iq**	
8. Course objectives	
Course objectives	• Providing students with knowledge of the principles of thermodynamics as one of the basic branches of physical chemistry. • Developing students' ability by knowing the most important scientific concepts and rules that must be followed to understand the mechanisms of chemical reactions and how to control them. • Teaching students how to use and apply laws in the practical aspect. • Preparing students to practice the career of teaching chemistry in the academic institutions.
9. Teaching and Learning Strategies	
Strategy	1. Standard method (lectures). 2. Discussion and Questioning method. 3. practical method.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
Sep. 3	6		**General properties of gases**	Standard and practical method	Class performance and exams
Sep. 4	6		**Ideal gas laws**	Standard and practical method	Class performance and exams
Oct. 1	6		**Kinetic theory of ideal gases**	Standard and practical method	Class performance and exams
Oct. 2	6		**The First law of thermodynamics**	Standard and practical method	Class performance and exams
Oct. 3	6		**Types of thermodynamic processes**	Standard and practical method	Class performance and exams
Oct. 4	6		**Energy and enthalpy**	Standard and practical method	Class performance and exams
Nov. 1	6		**Thermochemistry**	Standard and practical method	Class performance and exams
Nov. 2	6		**Phase transition enthalpies**	Standard and practical method	Class performance and exams
Nov. 3	6		**Heat of formation**	Standard and practical method	Class performance and exams
Nov. 4	6		**Heat of combustion**	Standard and practical method	Class performance and exams
Des. 1	6		**heat of neutralization**	Standard and practical method	Class performance and exams
Des. 2	6		**Bond energies**	Standard and practical method	Class performance and exams
Des. 3	6		**The Second law of thermodynamics**	Standard and practical method	Class performance and exams
Des.4	6		**Entropy**	Standard and practical method	Class performance and exams
Jan. 1	6		**Calculate the change in entropy**	Standard and practical method	Class performance and exams

Jan. 2	6		**The Third law of thermodynamics**	Standard and practical method	Class performance and exams
Jan/ 3	**Spring holiday**				
Jan. 4					
Feb. 1	6		**The Free energy**	Standard and practical method	Class performance and exams
Feb. 2	6		**Standard free energy of formation**	Standard and practical method	Class performance and exams
Feb. 3	6		**Chemical potential**	Standard and practical method	Class performance and exams
Feb. 4	6		**Chemical equilibrium**	Standard and practical method	Class performance and exams
Mar. 1	6		**Law of mass action**	Standard and practical method	Class performance and exams
Mar. 2	6		**Lee-chatelier Brown rule**	Standard and practical method	Class performance and exams
Mar.3	6		**The equilibrium constant changes with temperature**	Standard and practical method	Class performance and exams
Mar. 4	6		**Phase equilibria**	Standard and practical method	Class performance and exams
Apr. 1	6		**Uses of the phase rule**	Standard and practical method	Class performance and exams
Apr. 2	6		**Surface tension**	Standard and practical method	Class performance and exams
Apr. 3	6		**Adsorption**	Standard and practical method	Class performance and exams
Apr. 4	6		**Examples and solutions**	Standard and practical method	Class performance and exams
May 1	6		**General Review**	Standard and practical method	Class performance and exams

11. Course Evaluation
3- Formative evaluation through daily exams, observing the student's performance in class discussions and homework assignments, and classroom evaluation. This grade does not exceed 20% of the total. 4- Diagnostic evaluation by semester and final exams to issue judgments of success and failure. This grade is 80% and is divided into (4) semester exams during the year, that is, two exams for each semester, to extract the annual quest before entering the final exams.

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	**"Physical chemistry"**, Written by Laila Muhammad Naguib and Mahmoud Shaker Saeed., Mosul University, college of Education, 1990.
Main references (sources)	"**Atkins' Physical Chemistry**". Peter Atkins, Julio de Paula, James Keeler, 11^{t} Ed. 2018.
Recommended books and references (scientific journals, reports …)	Access to everything that is current and published in peer-reviewed scientific journals
Electronic References, Websites	https://scholar.google.com/ https://www.sciencedirect.com/ https://www.researchgate.net/

Course Description Form

1. Course Name:	
Advanced Organic Chemistry Ph.D.	
2. Course Code:	
3. Semester / Year:	
Annual / 2025-2026	
4. Description Preparation Date:	
18/9/2025	
5. Available Attendance Forms:	
Class attendance + electronic classes (Google Classroom), which will be a supporting class for the in-person class, and according to the conditions and instructions of the Ministry of Higher Education and Scientific Research.	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 hours per year / 6 units	
7. Course administrator's name (mention all, if more than one name)	
Name: **Prof. Dr. Fawzi Hameed Jumaaa** Email: **fawzi.99883@tu.edu.iq**	
8. Course objectives	
Course objectives	• Providing students with knowledge of the principles of organic chemistry as one of the basic branches of advanced organic chemistry. • Developing students' ability by knowing the most important scientific concepts and rules that must be followed to understand the mechanisms of chemical reactions and how to control them. • Teaching students how to use and apply laws in the practical aspect. • Preparing students to practice the career of teaching chemistry in the academic institutions.

9. Teaching and Learning Strategies	
Strategy	1. Standard method (lectures). 2. Discussion and Questioning method. 3. practical method.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Sep. 3	6		**Introduction to electrophilic addition reactions**	Standard and practical method	Class performance and exams
Sep. 4	6		**Nucleophilic addition reactions**	Standard and practical method	Class performance and exams
Oct. 1	6		**Elimination reactions in alkyl halides**	Standard and practical method	Class performance and exams
Oct. 2	6		**Nucleophilic substitution reactions**	Standard and practical method	Class performance and exams
Oct. 3	6		**Substitution reactions in the benzene ring**	Standard and practical method	Class performance and exams
Oct. 4	6		**Oxidation and reduction reactions**	Standard and practical method	Class performance and exams
Nov. 1	6		**Free radical replacement reactions**	Standard and practical method	Class performance and exams
Nov. 2	6		**Alpha-hydrogen acid reactions**	Standard and practical method	Class performance and exams
Nov. 3	6		**Organic catalysts**	Standard and practical method	Class performance and exams
Nov. 4	6		**Preparation of some pharmaceutical compounds**	Standard and practical method	Class performance and exams
Des. 1	6		**Reactions of alcohols, ethers and thiols**	Standard and practical method	Class performance and exams

Des. 2	6		**Rearrangement reactions**	Standard and practical method	Class performance and exams
Des. 3	6		**Polycyclic hydrocarbons**	Standard and practical method	Class performance and exams
Dec.4	6		**Yield reactions of phosphorus and sulfur**	Standard and practical method	Class performance and exams
Jan. 1	6		**Semester exam**	Standard and practical method	Class performance and exams

11. Course Evaluation

5- Formative evaluation through daily exams, observing the student's performance in class discussions and homework assignments, and classroom evaluation. This grade does not exceed 30% of the total.

6- Diagnostic evaluation by semester and final exams to issue judgments of success and failure.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Morrison R.T. and Boyd R.N., "Organic Chemist", 6th Edition, Prentice – Hall. Englewood Cliffs, New Jersey 07632, (1992).
Main references (sources)	Jumaa Fawzi Hameed, "Advanced Organic Chemistry," Al-Dhakraya Publishing and Distribution - Baghdad , 1st Edition (2022).
Recommended books and references (scientific journals, reports …)	Access to everything that is current and published in peer-reviewed scientific journals
Electronic References, Websites	https://scholar.google.com/ https://www.sciencedirect.com/ https://www.researchgate.net/

Course Description Form

1. Course Name:	
Heterocyclic Chemistry Ph.D.	
2. Course Code:	
3. Semester / Year:	
Annual / 2025-2026	
4. Description Preparation Date:	
18/9/2025	
5. Available Attendance Forms:	
Class attendance + electronic classes (Google Classroom), which will be a supporting class for the in-person class, and according to the conditions and instructions of the Ministry of Higher Education and Scientific Research.	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 hours per year / 6 units	
7. Course administrator's name (mention all, if more than one name)	
Name: **Prof. Dr. Fawzi Hameed Jumaaa** Email: **fawzi.99883@tu.edu.iq**	
8. Course objectives	
Course objectives	• Providing students with knowledge of the principles of organic chemistry as one of the basic branches of heterocyclic chemistry. • Developing students' ability by knowing the most important scientific concepts and rules that must be followed to understand the mechanisms of chemical reactions and how to control them. • Teaching students how to use and apply laws in the practical aspect. • Preparing students to practice the career of teaching chemistry in the academic institutions.
9. Teaching and Learning Strategies	
Strategy	1. Standard method (lectures). 2. Discussion and Questioning method. 3. practical method.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
Jan. 3	**6**		**Three membered ring-aziridine compounds**	Standard and practical method	Class performance and exams
Jan. 4	**6**		**Four membered ring azitidine compounds**	Standard and practical method	Class performance and exams
Feb. 1	**6**		**Four membered ring-oxetane**	Standard and practical method	Class performance and exams
Feb. 2	**6**		**Six membered ring-benzooxazine-4-one**	Standard and practical method	Class performance and exams
Feb. 3	**6**		**Six membered ring: diazine, oxazine, and thiazine**	Standard and practical method	Class performance and exams
Feb. 4	**6**		**Sevene membered ring- oxazepine**	Standard and practical method	Class performance and exams
Mar. 1	**6**		**Six membered ring-pyrrole**	Standard and practical method	Class performance and exams
Mar. 2	**6**		**Five membered ring-furans**	Standard and practical method	Class performance and exams
Mar. 3	**6**		**Five membered ring-thiophene**	Standard and practical method	Class performance and exams
Mar. 4	**6**		**Five membered ring-1,2-azoles**	Standard and practical method	Class performance and exams
Apr. 1	**6**		**Five membered ring 1,3,4-oxadizole**	Standard and practical method	Class performance and exams
Apr. 2	**6**		**Five membered ring-1.2.4- Triazole**	Standard and practical method	Class performance and exams
Apr. 3	**6**		**Five membered ring-1,3,4-oxadiazole**	Standard and practical method	Class performance and exams
Apr.4	**6**		**Five membered ring-1,3,4-thiadiazole**	Standard and practical method	Class performance and exams

May. 1	**6**		**Final exam**	Standard and practical method	Class performance and exams

11. Course Evaluation
7- Formative evaluation through daily exams, observing the student's performance in class discussions and homework assignments, and classroom evaluation. This grade does not exceed 30% of the total. 8- Diagnostic evaluation by semester and final exams to issue judgments of success and failure.

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Augustin, R.M., translated by Al-Nima, Hikmat Hussein and Abdul Malik, Rasmi Tawfiq and Yassin, Ahmed Abdul Aziz, "Introduction to Heterocyclic Compounds," Mosul University Press (1983).
Main references (sources)	1-Gupta R.R.,Kumar M. and Gupta V. "Heterocyclic Chemistry II ,Five - Membered Heterocycles", Springer,(1999). 2-Louis D.Q. and John A.T., "Fundamentals of Heterocyclic Chemistry, Importance in Natural and in the Synthesis of Pharmaceuticals, 10thEdition, John Wiley& Sons. Inc., (2010).
Recommended books and references (scientific journals, reports …)	Access to everything that is current and published in peer-reviewed scientific journals
Electronic References, Websites	https://scholar.google.com/ https://www.sciencedirect.com/ https://www.researchgate.net/

Course Description Form

1. Course Name:
Stereochemistry Ph.D.
2. Course Code:
3. Semester / Year:
Annual / 2025-2026
4. Description Preparation Date:
18/9/2025
5. Available Attendance Forms:
Class attendance + electronic classes (Google Classroom), which will be a supporting class for the in-person class, and according to the conditions and instructions of the Ministry of Higher Education and Scientific Research.
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours per year / 6 units
7. Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Fawzi Hameed Jumaaa** Email: **fawzi.99883@tu.edu.iq**
8. Course objectives

Course objectives	• Providing students with knowledge of the principles of organic chemistry as one of the basic branches of advanced organic chemistry. • Developing students' ability by knowing the most important scientific concepts and rules that must be followed to understand the mechanisms of chemical reactions and how to control them. • Teaching students how to use and apply laws in the practical aspect. • Preparing students to practice the career of teaching chemistry in the academic institutions.

9. Teaching and Learning Strategies	
Strategy	5- Standard method (lectures). 6- Discussion and Questioning method. 7- practical method.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Sep. 3	2		**Fundamentals of Stereo-chemistry(Aixs of symmetry, Center of symmetry)**	Standard and practical method	Class performance and exams
Sep. 4	2		**Enantiomers, Diastereoisomers, meso compounds, Rac. Mix.**	Standard and practical method	Class performance and exams
Oct. 1	2		**Nomenclature of stereoisomers systems**	Standard and practical method	Class performance and exams
Oct. 2	2		**R and S System, D and L System,**	Standard and practical method	Class performance and exams
Oct. 3	2		**Cis and Trans System Erythro and Threo System**	Standard and practical method	Class performance and exams
Oct. 4	2		**Chiral center formation, Alkanes halogenation**	Standard and practical method	Class performance and exams
Nov. 1	2		**Addition of hydrogen halide to alkenes**	Standard and practical method	Class performance and exams
Nov. 2	2		**Addition of hydrogen halide to 1,3-butadiene**	Standard and practical method	Class performance and exams
Nov. 3	2		**Methods Separation of Enantiomers**	Standard and practical method	Class performance and exams
Nov. 4	6		**Mechanical Analysis, Biological separation**	Standard and practical method	Class performance and exams

Dec. 1	2		**Conformation Isomers of Alkanes, Conform-ation isomers of linear alkanes**	Standard and practical method	Class performance and exams
Dec. 2	2		**Conformation Isomers of Cyclohexane**	Standard and practical method	Class performance and exams
Dec. 3	2		**Stereoisomers Reactions,**	Standard and practical method	Class performance and exams
Dec.4	2		**Anomeric Effect, Origin of The Anomeric Effect**	Standard and practical method	Class performance and exams
Jan. 1			**Final exam**	Standard and practical method	Class performance and exams

11. Course Evaluation

9- Formative evaluation through daily exams, observing the student's performance in class discussions and homework assignments, and classroom evaluation. This grade does not exceed 30% of the total.

10- Diagnostic evaluation by semester and final exams to issue judgments of success and failure.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Eliel E. L., Wilen S. H. and Mander L. N., "**Stereochemistry of Organic Compounds**", John Wiley & Sons: New York (1993). 2-Morrison R.T. and Boyd R.N., "**Organic Chemist**", 6th Edition, Prentice – Hall. Englewood Cliffs, New Jersey 07632, (1992).
Main references (sources)	3-Jumaa Fawzi Hameed, "**Advanced Stereochemistry**," Al-Dhakraya Publishing and Distribution - Baghdad , 1st Edition (2024).
Recommended books and references (scientific journals, reports …)	Access to everything that is current and published in peer-reviewed scientific journals
Electronic References, Websites	https://scholar.google.com/ https://www.sciencedirect.com/ https://www.researchgate.net/