



**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

2024

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.

Academic Program Description Form

University Name: Tikrit

Faculty/Institute: Pharmacy

Scientific Department: Pharmaceutical Chemistry

Academic or Professional Program Name: Sciences in pharmacy

Final Certificate Name: Bachelor in Pharmacy

Academic System: Semester (courses)

Description Preparation Date: 1/ 3/ 2024

File Completion Date: 15/ 3/ 2024

Signature:



Head of Department Name:

Lect. Dr. Ali H. Mustafa

Date: 16 /3/ 2024

Signature:



Scientific Associate Name:

Lect. Dr. Ali H. Abbas

Date:

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Nashwan Ahmad Ceamid

Date:

Signature:



Approval of the Dean

Academic Program Description

This academic program description provides a requisite summary of the most important characteristics of the program and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available opportunities. It is accompanied by a description of each course within the program

1. Educational institution	Tikrit university/college of pharmacy
2. Scientific department	Pharmaceutical chemistry
3. Name of Academic Program	Sciences in pharmacy
4. Final certificate name	Bachelor in Pharmacy
5. Learning system : Annual / courses / other	Semester (courses)
6. Accreditation Program approved	ACPE
7. Other external influences	Training courses in hospitals, pharmaceutical industries and private pharmacies.
8. Description creation date	16/4/2024
9. Academic Program Objectives Graduation of qualified pharmacists capable of preparing, diagnosing and studying the chemical and physical properties and biological efficacy of drugs.	
The program is for five years and ten semesters	
First stage / first semester / analytical chemistry: The student studies the basics of analytical chemistry and its divisions, methods of preparation, measurement, concentration, quantitative and volumetric analysis, and spectroscopy.	
First stage / second semester / organic chemistry I : the student studies organic chemistry, its theoretical fundamentals, methods of separation and preparation.	
Second stage / first semester / organic chemistry II: The student studies organic chemical reactions and the mechanisms of reactions.	
Second stage / second semester / organic chemistry III: The student studies the organic cyclic compounds that are used in the synthesis of the drugs.	
Third stage / first semester / inorganic pharmaceutical chemistry: Inorganic Pharmaceutical Chemistry, which is concerned with the preparation of drugs that contain inorganic compounds	

Third stage / second semester / organic pharmaceutical chemistry I: It is concerned with studying the chemical and physical properties of drugs, as well as their disintegration in the body.

Fourth stage / first semester / organic pharmaceutical chemistry II: concerning with studying of nervous system drugs, analgesics and hormones.

Fourth stage / second semester / organic pharmaceutical chemistry III: concerning with studying of the anti-infective and antineoplastic agents.

Fifth stage / first semester / organic pharmaceutical chemistry IV: It studies modern methods of preparing medicines and ways to increase their effectiveness and solve the problems of some medicines.

Fifth stage / second semester /Advanced Pharmaceutical Analysis: It studies the spectroscopic methods necessary for the diagnosis of drugs in the laboratory as well as their follow-up in the body.

10. Outcomes of the program and the Required methods of teaching, learning and assessment

A. Cognitive goals

- A1-Introducing the methods of preparing medicinal chemical compounds
- A2-Introducing the methods of diagnosing chemical compounds by chemical and spectroscopic methods
- A3-Introduction to diagnostic methods, volumetric, quantitative and spectroscopic separation
- A4-Study of chemical and physical properties of drugs and drug metabolism
- A5- Study of changing the active groups of compounds in order to increase drug efficacy
- A 6- Knowing the pharmacological composition, side effects and the mechanism of action of the drug

B. Skillful goals

- B1 – Acquisition of drug preparation and manufacturing skills
- B2 – Acquiring skills to know the effect of some types of additives on the properties of medicines
- B3 -Acquisition of skills to increase the stability of drug forms outside or inside the body

Teaching and learning methods

- 1- Theoretical lectures
- 2- Training lectures
- 3- Scientific research
- 4- Seminars

Evaluation methods

- 1- Mid-term and final exams
- 2- Oral and written exams
- 3- Lab reports
- 4- Graduation projects

C- Emotional and Social goals

C1-Enhance students' ability to think and reason logically to solve manufacturing problems

C2-Actual application with existing capabilities

C3- Develop the student's ability to take advantage of the available means

C4- Develop the student's ability to perform daily duties and instill the values of scientific honesty and how to deal with the patient

Teaching and learning methods

- 1- Explanation and clarification
- 2- Experiments in laboratories
- 3- Lecture
- 4- Self-education
- 5- Visit scientific websites and download equable and recent research

Evaluation methods

Theoretical and practical exams in addition to class activities and scientific seminars

D- General And Qualifying skills (other Skills related to employability and personal development).

- 1- Activate the student's ability to deal with the Internet
- 2- Develop the student's ability to deal with modern laboratory equipment
- 3- Develop the student's ability to deal with multiple means to obtain information accurately
- 4- Develop the student's ability to dialogue and discussion

11. Program structure

Educational level	Course or course	Course or course	Credit hours per week
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	code	name	theoretical	practical
First/first semester	113	Analytical Chemistry	3	2
First/second semester	210	Organic chemistry I	3	2
Second/first semester	211	Organic chemistry II	3	2
Second/second semester	226	Organic chemistry III	2	2
Third/first semester	311	Inorganic Pharmaceutical Chemistry	2	2
Third/second semester	326	Organic Pharmaceutical Chemistry I	3	2
Fourth/ first semester	412	Organic Pharmaceutical Chemistry II	3	2
Fourth/ second semester	427	Organic Pharmaceutical Chemistry III	3	2
Fifth/first semester	511	Organic Pharmaceutical Chemistry IV	2	--
Fifth/ second semester	521	Advanced pharmaceutical analysis	3	2

12.Planning for personal development

Benefiting from international universities in personal development - increasing knowledge - scientific discussions - cultural events

13. Acceptance Standards (establish Regulations related to college or institute admission)

Admission is made within the central admission of the Ministry of Higher Education and Scientific Research for all of the following:

Graduates from the sixth scientific stage of preparatory study, the first students in the Medical Institute and the first students from the first stage of science and veterinary medicine colleges

14.The most important sources of information about the program

The World Health Organization and various scientific sources from books and the Internet, Committee of Deans of Colleges of Pharmacy in Iraq and the college website.

Curriculum Skills Outline

Please tick the quadrants corresponding to the individual learning outcomes from the program being evaluated

year/level	Course Code	Course Name	Essential or optional	Learning outcomes required from the program																			
				Cognitive goals					Skillful goals					Emotional goals					General and qualifying skills (Other skills related to employability and personal development)				
				A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	D1	D2	D3	D4	D5
First	113	Analytical Chemistry	Essential	√					√					√					√				
	121	organic chemistry I	Essential	√					√					√					√				
Second	211	organic chemistry II	Essential		√					√					√					√			
	226	organic chemistry III	Essential		√					√					√					√			
Third	311	Inorganic Pharmaceutical Chemistry	Essential			√					√					√					√		
	326	Organic Pharmaceutical Chemistry I	Essential			√					√					√					√		
Fourth	412	Organic Pharmaceutical Chemistry II	Essential				√					√				√						√	
	427	Organic	Essential				√					√				√						√	

		Pharmaceutical Chemistry III																					
Fifth	511	Organic Pharmaceutical Chemistry IV	Essential				√					√					√						√
	521	advanced pharmaceutical analysis	Essential				√					√					√						√

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Analytic chemistry/113
Available forms of attendance	Official time
Season/year	First/
Total study hours per week	5
The date the description preparation	
Course objectives	
<p>To provide students with a theoretical sound back ground in chemical principals that are essential to practice chemical analysis. It enables students to understand the importance of judging the accuracy and precision of experimental data and techniques of quantitative analysis, and also to show that theory frequently serves as a useful guide to the solution of analytical problems. Laboratory safety rules, glassware laboratory, prepare solutions from solids and liquids, volumetric analysis (Titration), Titration of hydrochloric acid with sodium carbonate solution, Titration of hydrochloric acid with sodium hydroxide solution, Titration of permanganate solution with potassium oxalate, Titration of potassium permanganate solution with ferrous sulfate, Determination of chloride by the Mohr method, Determination of a water hardness.</p>	

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques

B - Skillful objectives

B1- Gaining skill in how to deal with chemical compounds
B2- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

- C1-Preparation of different chemical compounds and medicines
C2-Learn about chemical compounds, drugs and their derivatives
C3-Doing chemical analyses

D - General and rehabilitative skills (Other skills related to employability and personal development)

- D1-Doing scientific experiments
D2-Acquiring the skill of preparing medicines
D3-Giving students confidence by presenting scientific research
D4-Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	Education method	Evaluation method
1	3		Review of elementary concept important to analytical chemistry: strong and weak electrolytes, importance weight and concentration	Lectures	Quiz
2	3		Review of elementary concept important to analytical chemistry: strong and weak electrolytes, importance weight and concentration	Lectures	Quiz

3	3		The evaluation to gravimetric data, definition of term	Lectures	Quiz
4	3		The evaluation to gravimetric data, definition of terms.	Lectures	Quiz
5	3		An introduction to gravimetric analysis, statistical analysis of data, rejection of data, precipitation method	Lectures	Quiz
6	3		An introduction to gravimetric analysis, statistical analysis of data, rejection of data, precipitation methods	Lectures	Quiz
7	1.5		Mid Examination		
8	3		The scope of application of gravimetric analysis , inorganic and organic precipitating agents	Lectures	Quiz
9	3		The scope of application of gravimetric analysis , inorganic and organic precipitating agents	Lectures	Quiz
10	3		An introduction to volumetric methods of analysis, volumetric calculations acid-base equilibria and PH calculations	Lectures	Quiz
11	3		An introduction to volumetric methods of analysis, volumetric calculations acid-base equilibria and PH calculations	Lectures	Quiz
12	3		Theory of neutralization titrations of complex systems	Lectures	Quiz

13	3		Theory of neutralization titrations of complex systems	Lectures	Quiz
14	3		Calculation of PH in complex system	Lectures	Quiz
15	3		Calculation of PH in complex system	Lectures	Quiz
16	3		Final Examination		

Resources

1. Required course books	1. Fundamentals of Analytical chemistry by Skoog and West, latest edition. 2-Chemical Analysis in the Laboratory A Basic Guide, by I. Mueller-Harvey and RM Baker, latest edition.
2. Main references (sources)	2.Modern Pharmaceutical Drug Analysis, by L. Zechmeister, latest edition.
a. Recommended books and references (scientific journals, reports)	
b. Electronic references, websites	

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Organic Chemistry I/210

Available forms of attendance	Official time
Season/year	First stage – second semester/
Total study hours per week	5
Date of preparation of the description	
<p>Course objectives</p> <p>To teach students the principles and basics of organic chemistry, which includes classes of hydrocarbon compounds such as (Alkanes, alkenes, alkynes, cycloalkanes, alkyl halides, alcohols and ethers, stereochemistry) This includes studying the properties of these compounds, their pharmaceutical importance, methods of preparation and then their reactions.</p>	

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques

B - Skillful objectives

- B 1- Gaining skill in preparing compounds and medicines
- B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
- B3- Gaining skill in how to deal with chemical compounds
- B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

- C1-Preparation of different chemical compounds and medicines
- C2-Learn about chemical compounds, drugs and their derivatives
- C3-Doing chemical analyses

D - General and rehabilitative skills (Other skills related to

employability and personal development)

D1-Doing scientific experiments

D2-Acquiring the skill of preparing medicines

D3-Giving students confidence by presenting scientific research

D4-Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	education method	Evaluation method
1	3		Introduction	Lectures	Quiz
2	3		Methane	Lectures	Quiz
3	3		Alkanes	Lectures	Quiz
4	3		Cycloalkanes	Lectures	Quiz
5	3		Alkenes I	Lectures	Quiz
6	3		Alkenes II	Lectures	Quiz
7	3		Alkynes	Lectures	Quiz
8	3		Dienes	Lectures	Quiz
9	3		Stereochemistry I	Lectures	Quiz
10	3		Stereochemistry II	Lectures	Quiz
11	3		Alcohols	Lectures	Quiz
12	3		Alcohols I	Lectures	Quiz
13	3		Ethers	Lectures	Quiz
14	3		Alkyl halides I	Lectures	Quiz
15	3		Alkyl halides II	Lectures	Quiz
16	3		Final examination		

Resources

1. Required course books	Morrison and RN Boyd "Organic Chemistry" latest edition
2. Main references (sources)	John McMurry "Organic Chemistry" latest edition
a. Recommended books and references (scientific journals, reports)	
b. Electronic references, websites	

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Organic chemistry II/211
Available forms of attendance	Official time
Season/year	Second stage – first semester/
Total study hours per week	5
Date of preparation of the description	

Course objectives

Be able to explain the reactivity of substituted aromatic compounds.

Be looking at the relationship between aromatic structure and reactivity

To enable students to understand the chemistry of carbon, classification, properties and reactions of organic compounds

It includes understanding the basic structure and properties of Benzene, Aromatic compounds, Carboxylic acids, Functional derivatives of carboxylic acids, Aldehydes, Ketones, Phenols and

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques
- A4- Know the methods used to prepare medicines

B - Skillful objectives

- B 1- Gaining skill in preparing compounds and medicines
- B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
- B3- Gaining skill in how to deal with chemical compounds
- B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

- C1-Preparation of different chemical compounds and medicines
- C2-Learn about chemical compounds, drugs and their derivatives
- C3-Doing chemical analyses

D - General and rehabilitative skills (Other skills related to employability and personal development)

- D1-Doing scientific experiments
- D2-Acquiring the skill of preparing medicines
- D3-Giving students confidence by presenting scientific research
- D4-Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning	The name of the unit or topic	Education method	Evaluation method
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		outcomes			
1	3	Synthesis	Benzene and aromatic compounds (Theory)	Lectures	Quiz
2	3	Reaction	Electrophilic Aromatic Substitution	Lectures	Quiz
3	3	Synthesis and reaction	Phenols I	Lectures	Quiz
4	3	Synthesis and reaction	Phenols II	Lectures	Quiz
5	3	Synthesis and reaction	Carboxylic acids I	Lectures	Quiz
6	3	Synthesis and reaction	carboxylic acids II	Lectures	Quiz
7	3	Synthesis and reaction	Functional Derivatives of Carboxylic acids I	Lectures	Quiz
8	1.5		Mid Examination		
9	3	Synthesis and reaction	Functional Derivatives of Carboxylic acids II	Lectures	Quiz
10	3	Synthesis and reaction	Aldehydes I	Lectures	Quiz
11	3	Synthesis and reaction	Aldehydes II	Lectures	Quiz
12	3	Synthesis and reaction	Ketones	Lectures	Quiz
13	3	Synthesis and reaction	Amines I	Lectures	Quiz
14	3	Synthesis and reaction	Amines II	Lectures	Quiz
15	3		Final Examination		

Resources

1. Required course books

Morrison and RN Boyd "Organic Chemistry"
latest edition

2. Main references (sources)	John McMurry "Organic Chemistry" latest edition
a. Recommended books and references (scientific journals, reports)	
b. Electronic references, websites	

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Organic chemistry III /226
Available forms of attendance	Official time
Season/year	Second stage – second semester /
Total study hours per week	4
Date of preparation of the description	

Course objectives

To teach students the principles of heterocyclic chemistry including the fundamental principles and the features, classes and reactions of heterocyclic compounds; it enable students to apply these principles in complicated reactions that involve heteroatoms.

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques
- A4- Know the methods used to prepare medicines

B - Skillful objectives

B 1- Gaining skill in preparing compounds and medicines

B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines

B3- Gaining skill in how to deal with chemical compounds

B4- Skill in writing scientific reports

Teaching and learning methods

1- Lectures

2- Perform practical experiments

3- Reading textbooks

4- Conducting scientific discussions

Evaluation methods

1- Oral and written exams

2- Practical exams after each experiment

3- Mid-term exam (theory)

4- Final exam (theory)

C- Emotional goals

C1-Preparation of different chemical compounds and medicines

C2-Learn about chemical compounds, drugs and their derivatives

C3-Doing chemical analyses

D - General and rehabilitative skills (Other skills related to employability and personal development)

D1-Doing scientific experiments

D2-Acquiring the skill of preparing medicines

D3-Giving students confidence by presenting scientific research

D4-Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	Education method	Evaluation method
1	2		Heterocyclic system: Classes of heterocyclic systems; general structures; properties; Occurrence in	Lectures	Quiz

			nature and in medicinal products. I (Theory)		
2	2		Heterocyclic system: Classes of heterocyclic systems; general structures; properties; Occurrence in nature and in medicinal products. II	Lectures	Quiz
3	2	Synthesis and reaction	Five-membered ring heterocyclic compounds: Pyrrole; furan and thiophene. I	Lectures	Quiz
4	2	Synthesis and reaction	Five-membered ring heterocyclic compounds: Pyrrole; furan and thiophene. II	Lectures	Quiz
5	2	Synthesis and reaction	Source of pyrrole, furan and thiophene.	Lectures	Quiz
6	2	Synthesis and reaction	Source of pyrrole, furan and thiophene. II	Lectures	Quiz
7	2	Synthesis and reaction	Electrophilic substitution in Pyrrole, furan and thiophene: Reactivity and orientation. I	Lectures	Quiz
8	1.5		Mid Examination		
9	2	Synthesis and reaction	Electrophilic substitution in Pyrrole, furan and thiophene: Reactivity and orientation. II	Lectures	Quiz
10	2	Synthesis and reaction	Six-membered ring heterocyclic compounds: Structure & reactions of pyridine. I	Lectures	Quiz
11	2	Synthesis and reaction	Six-membered ring heterocyclic compounds: Structure & reactions of pyridine. II	Lectures	Quiz
12	2	Synthesis and reaction	Saturated five membered heterocyclic compounds	Lectures	Quiz
13	2	Synthesis and reaction	Saturated five membered	Lectures	Quiz

			heterocyclic compounds II		
14	2	Synthesis and reaction	Heterocyclic of five & six member rings with two & three heteroatoms	Lectures	Quiz
15	3		Final Examination		

Resources

1. Required course books	Morrison and RN Boyd "Organic Chemistry" latest edition
2. Main references (sources)	John McMurry "Organic Chemistry" latest edition
a. Recommended books and references (scientific journals, reports)	
b. Electronic references, websites	

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Inorganic pharmaceutical chemistry/311
Available forms of attendance	Official time
Season/year	Third stage – first semester/ 2020-2021

Total study hours per week	4
Date of preparation of the description	
Course objectives	
<i>The study of inorganic chemical compounds and their uses in medical diagnosis and treatment</i>	

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques
- A4- Know the methods used to prepare medicines

B - Skillful objectives

- B 1- Gaining skill in preparing compounds and medicines
- B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
- B3- Gaining skill in how to deal with chemical compounds
- B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

- C1-Preparation of different chemical compounds and medicines
- C2-Learn about chemical compounds, drugs and their derivatives
- C3-Doing chemical analyses

D - General and rehabilitative skills (Other skills related to employability and personal development)

- D1-Doing scientific experiments
- D2-Acquiring the skill of preparing medicines
- D3-Giving students confidence by presenting scientific research
- D4-Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	Education method	Evaluation method
1	2	Definition and application in the medical and pharmaceutical field	Atomic and molecular structure/complexes	Lectures	Quiz
2	2	Definition and application in the medical and pharmaceutical field	Atomic and molecular structure/complexes	Lectures	Quiz
3	2	Definition and application in the medical and pharmaceutical field	Atomic and molecular structure/complexes	Lectures	Quiz
4	2	Definition and application in the medical and pharmaceutical field	Atomic and molecular structure/complexes	Lectures	Quiz
5	2	Definition and application in the medical and pharmaceutical field	Gastrointestinal agents	Lectures	Quiz
6	2	Definition and application in the medical and pharmaceutical field	Protective adsorbents	Lectures	Quiz
7	2	Definition and application in the medical and pharmaceutical field	Topical agents	Lectures	Quiz
8	1.5		Mid Examination		
9	2	Definition and application in the medical and pharmaceutical field	Dental agents	Lectures	Quiz

10	2	Definition and application in the medical and pharmaceutical field	Dental agents	Lectures	Quiz
11	2	Definition and application in the medical and pharmaceutical field	Radiopharmaceutical preparations	Lectures	Quiz
12	2	Definition and application in the medical and pharmaceutical field	Radiopharmaceutical preparations	Lectures	Quiz
13	2	Definition and application in the medical and pharmaceutical field	Radio opaque and contrast media	Lectures	Quiz
14	2	Definition and application in the medical and pharmaceutical field	Dental agents	Lectures	Quiz
15	3		Final Examination		

Resources

1. Required course books	Wilson and Griswold's Textbook of Organic Medicinal and Pharmaceutical Chemistry latest edition.
2. Main references (sources)	Inorganic Medicinal and Pharmaceutical Chemistry by block, Roche Soine and Wilson, Latest addition
a. Recommended books and references (scientific journals, reports)	Faye's Principles of Medicinal Chemistry by David A. Williams and Thomas L. Lemke, latest edition.
b. Electronic references, websites	Google for searching topics about practical pharmaceutical chemistry

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Organic pharmaceutical chemistry I/326
Available forms of attendance	Official time
Season/year	Third stage – second semester/
Total study hours per week	5
Date of preparation of the description	

Course objectives

1. Knowing the biological activity, if any, of the chemical composition.
2. Knowing and studying the effective groups of the drugs included in the study.
3. A link between the chemical composition and biological activity of drugs
4. Learn about some types of drugs, including methods of preparation and characterization.
5. Explain how to avoid unwanted side effects from the studied drugs.

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment

- A3- Learning using different scientific techniques
 A4- Know the factors that affect the stability, solubility and absorption of drugs
 A5- Knowledge of the mechanism of action of the drug and the relationship of the chemical composition to it
 A6- Know the methods used to prepare medicines

B - Skillful objectives

- B1- Gaining skill in preparing compounds and medicines
 B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
 B3- Gaining skill in how to deal with chemical compounds
 B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

- C1- Knowing how to design drugs and chemical compounds
 C2- Knowledge of methods of synthesis of drugs and chemical compounds in the laboratory
 C3- Learn laboratory analysis methods to know the composition of chemical compounds
 C4- Preparing different medicines

D - General and rehabilitative skills (Other skills related to employability and personal development)

- D1- Doing scientific experiments
 D2- Acquiring the skill of preparing medicines
 D3- Giving students confidence by presenting scientific research
 D4- Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	Education method	Evaluation method
1	3	Definition and application in the medical and pharmaceutical field	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450 monooxygenases in	Lectures	Quiz

			oxidative biotransformation; oxidative reactions; reductive reactions; hydrolytic reactions; Phase II reactions		
2	3	Definition and application in the medical and pharmaceutical field	Drug distribution.	Lectures	Quiz
3	3	Definition and application in the medical and pharmaceutical field	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450 monooxygenases in oxidative biotransformation; oxidative reactions; reductive reactions; hydrolytic reactions; Phase II reactions	Lectures	Quiz
4	3	Definition and application in the medical and pharmaceutical field	Acid –base properties	Lectures	Quiz
5	3	Definition and application in the medical and pharmaceutical field	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450 monooxygenases in oxidative biotransformation; oxidative reactions; reductive reactions; hydrolytic reactions; Phase II reactions	Lectures	Quiz
6	3	Definition and application in the medical and pharmaceutical field	QSAR models.	Lectures	Quiz
7	3	Definition and application in the medical and pharmaceutical field	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450	Lectures	Quiz

			monooxygenases in oxidative biotransformation; oxidative reactions; reductive reactions; hydrolytic reactions; Phase II reaction		
8	3	Definition and application in the medical and pharmaceutical field	Molecular modeling (computer aided drug design) and Drug receptor interaction: force involved	Lectures	Quiz
9	3	Definition and application in the medical and pharmaceutical field	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450 monooxygenases in oxidative biotransformation; oxidative reactions; reductive reactions; hydrolytic reactions; Phase II reaction	Lectures	Quiz
10	3	Definition and application in the medical and pharmaceutical field	Steric features of drugs.	Lectures	Quiz
11	3	Definition and application in the medical and pharmaceutical field	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450 monooxygenases in oxidative biotransformation; oxidative reactions; reductive reactions; hydrolytic reactions; Phase II reaction	Lectures	Quiz
12	3	Definition and application in the medical and pharmaceutical field	Optical isomerism and biological activity and Calculated conformation	Lectures	Quiz
13	3	Definition and application in the medical and	Three- dimensional quantitative structure activity relationships	Lectures	Quiz

		pharmaceutical field	and databases and isosterism		
14	3	Definition and application in the medical and pharmaceutical field	Drug-receptor interaction and subsequent events	Lectures	Quiz
15	3	Definition and application in the medical and pharmaceutical field	factors affecting drug metabolism.	Lectures	Quiz
16	3		Final Examination		

Resources

1. Required course books	Wilson and Griswold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, latest edition.
2. Main references (sources)	Inorganic Medicinal and Pharmaceutical Chemistry by block, Roche Soine and Wilson, Latest addition
a. Recommended books and references (scientific journals, reports)	Faye's Principles of Medicinal Chemistry by David A. Williams and Thomas L. Lemke, latest edition.
b. Electronic references, websites	Google for searching topics about practical pharmaceutical chemistry

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry

Course name/code	Organic pharmaceutical chemistry II/412
Available forms of attendance	Official time
Season/year	Fourth stage – first semester/
Total study hours per week	5
Date of preparation of the description	
<p>Course objectives</p> <p>The first course discusses different drugs affecting adrenergic and cholinergic receptors, CNS depressant and CNS stimulant. Analgesics either those having narcotic action or those of non-narcotic activity as well as non-steroidal anti-inflammatory agents and drugs used for the treatment of gout will be studied. Moreover, the drugs acting as H1 and H2 antagonists are presented. Steroidal and non-steroidal hormones. The chemical structure, the mechanism of action and structure activity relationship of such a group of the studied drugs will be illustrated.</p>	

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques
- A4- Know the factors that affect the stability, solubility and absorption of drugs
- A5- Knowledge of the mechanism of action of the drug and the relationship of the chemical composition to it
- A6- Know the methods used to prepare medicines

B - Skillful objectives

- B1- Gaining skill in preparing compounds and medicines
- B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
- B3- Gaining skill in how to deal with chemical compounds
- B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment

3- Mid-term exam (theory)

4- Final exam (theory)

C- Emotional goals

C1- Knowing how to design drugs and chemical compounds

C2- Knowledge of methods of synthesis of drugs and chemical compounds in the laboratory

C3- Learn laboratory analysis methods to know the composition of chemical compounds

C4- Preparing different medicines

D - General and rehabilitative skills (Other skills related to employability and personal development)

D1-Doing scientific experiments

D2-Acquiring the skill of preparing medicines

D3-Giving students confidence by presenting scientific research

D4-Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	Education method	Evaluation method
1	3		Cholinergic receptors and their subtypes. stereochemistry and structure activity relationships (SAR); products.	Lectures	Quiz
2	3		Cholinesterase inhibitors structure-activity relationships (SAR).Solanaeous alkaloid and analogues, synthetic cholinergic blocking agents, products	Lectures	Quiz
3	3		Ganglionic blocking agents (neuromuscular blocking agents.	Lectures	Quiz
4	3		Structure and Physicochemical Properties, Biosynthesis Storage, Release, Uptake, and Metabolism	Lectures	Quiz
5	3		α -Adrenergic Receptors β -Adrenergic Receptors Drugs Affecting Catecholamine Biosynthesis	Lectures	Quiz

6	3		Drugs Affecting Catecholamine Storage and Release, Direct-Acting Sympathomimetic endogenous catecholamines (SAR)	Lectures	Quiz
7	3		α -adrenergic receptor agonists. β -adrenergic receptor agonists, and Indirect-Acting Sympathomimetic. α - blockers	Lectures	Quiz
8	1.5		Mid Examination		
9	3		Nonselective α -blockers, Irreversible α -blockers, Selective α 1-blockers. β blockers, nonselective β blockers.	Lectures	Quiz
10	3		Structure–Activity Relationships Of NSAIDs, Mechanism of Action and NSAID Induced Side Effects, enzymatic structure of Cyclooxygenases, classes of COX inhibitor	Lectures	Quiz
11	3		SAR of morphine meperidine, type molecules, methadone, type molecules, N-methyl benzomorphans, antagonist type analgesics in benzomorphans	Lectures	Quiz
12	3		Endogenous opioids, structure-activity relationships (SAR), Products and. Antitussive agents..	Lectures	Quiz
13	3		CNS depressant; Benzodiazepines and related compounds. Analeptics, central sympathomimetic agents, methyl xanthine. Barbiturates. Mechanism of action of Antipsychotics.	Lectures	Quiz
14	3		Anticonvulsants, clinically important anticonvulsants. Biological Activities of Mineralocorticoids and Glucocorticoids, Steroids	Lectures	Quiz

			Sex Hormones, progestin's and androgens		
15	3		Final examination		

Resources

1. Required course books	Wilson and Griswold's Textbook of Organic Medicinal and. Pharmaceutical Chemistry, latest edition. Faye's Principles of Medicinal Chemistry by David A. Williams and Thomas L. Lemke, latest edition.
2. Main references (sources)	
a. Recommended books and references (scientific journals, reports)	
b. Electronic references, websites	

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Organic pharmaceutical chemistry III/427
Available forms of attendance	Official time
Season/year	Fourth stage – second semester/
Total study hours per week	5
Date of preparation of the description	
Course objectives	
This course discusses antibiotics, antiviral, antifungal and anti-neoplastic agents. The role of medicinal chemistry in the discovery and development of synthetic therapeutic agents. It also enables students to understand the concept of structure activity	

relationships and its application in design and synthesis of new chemotherapeutic agents and hormone derivatives with potential biological activity.

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques
- A4- Know the factors that affect the stability, solubility and absorption of drugs
- A5- Knowledge of the mechanism of action of the drug and the relationship of the chemical composition to it
- A6- Know the methods used to prepare medicines

B - Skillful objectives

- B1- Gaining skill in preparing compounds and medicines
- B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
- B3- Gaining skill in how to deal with chemical compounds
- B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

- C1- Knowing how to design drugs and chemical compounds
- C2- Knowledge of methods of synthesis of drugs and chemical compounds in the laboratory
- C3- Learn laboratory analysis methods to know the composition of chemical compounds
- C4- Preparing different medicines

D - General and rehabilitative skills (Other skills related to employability and personal development)

- D1- Doing scientific experiments
- D2- Acquiring the skill of preparing medicines
- D3- Giving students confidence by presenting scientific research
- D4- Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	education method	Evaluation method
1	3	Definition and application in the medical and pharmaceutical field	β -lactam antibiotics. The penicillin's, Chemical Classification, β -lactam inhibitors.	Lectures	Quiz
2	3	Definition and application in the medical and pharmaceutical field	Cephalosporin's, Monobactams. Chemical classification, SAR. Mechanism of action, Microbial resistance and commercial production	Lectures	Quiz
3	3	Definition and application in the medical and pharmaceutical field	Amino glycosides & chloramphenicol. Chemical classification, SAR. Mechanism of action, Microbial resistance and commercial production	Lectures	Quiz
4	3	Definition and application in the medical and pharmaceutical field	Tetracycline's; macrolides chemical classification ,SAR Mechanism of action, Microbial resistance and commercial production	Lectures	Quiz
5	3	Definition and application in the medical and pharmaceutical field	Lincomycines & polypeptides. Chemical classification, SAR Mechanism of action, Microbial resistance and commercial production.	Lectures	Quiz
6	3	Definition and application in the medical and pharmaceutical field	sulfonamides; products; sulfones. SAR, Mechanism of action, Microbial resistance and commercial production	Lectures	Quiz
7	3	Definition and application in the medical and pharmaceutical field	Antiviral agents, The classification and biochemistry of viruses. Target for prevention of viral infection. Antiviral drugs. Chemical structures of some antiviral nucleoside and nucleotide analogs.	Lectures	Quiz

8	1.5		Mid Examination		
9	3	Definition and application in the medical and pharmaceutical field	Anti-fungal agents, Biochemical targets for antifungal chemotherapy. Classification of antifungal drugs and SAR.	Lectures	Quiz
10	3	Definition and application in the medical and pharmaceutical field	Anti-neoplastic agents; alkylating agents; Introduction, drug classes, Anti metabolites Introduction, drug classes.	Lectures	Quiz
11	3	Definition and application in the medical and pharmaceutical field	Antibiotics; Plant products; miscellaneous compounds	Lectures	Quiz
12	3	Definition and application in the medical and pharmaceutical field	Plant products: Vinca Alkaloids, Hormones and their antagonist	Lectures	Quiz
13	3	Definition and application in the medical and pharmaceutical field	Future Anti neoplastic agents	Lectures	Quiz
14	3	Definition and application in the medical and pharmaceutical field	Monoclonal ; antibody Gene therapy of cancer	Lectures	Quiz
15	3		Final Examination		

Resources

1. Required course books	Wilson and Griswold's Textbook of Organic Medicinal and. Pharmaceutical Chemistry, latest edition. Faye's Principles of Medicinal Chemistry by David A. Williams and Thomas L. Lemke, latest edition.
2. Main references (sources)	
a. Recommended books and references (scientific journals, reports)	
b. Electronic references, websites	

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution	Ministry of Higher Education and Scientific Research
Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Pharmaceutical Organic Chemistry IV / 511
Available forms of attendance	Official time
Season/year	Fifth stage – first semester/
Total study hours per week	2
Date of preparation of the description	
Course objectives To give the student knowledge and experience in prodrug as part of their medicinal and pharmaceutical field as well as combinatorial chemistry	

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques
- A4- Know the factors that affect the stability, solubility and absorption of drugs
- A5- Knowledge of the mechanism of action of the drug and the relationship of the chemical composition to it
- A6- Know the methods used to prepare medicines

B - Skillful objectives

- B1- Gaining skill in preparing compounds and medicines
- B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
- B3- Gaining skill in how to deal with chemical compounds
- B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

- C1- Knowing how to design drugs and chemical compounds
 C2- Knowledge of methods of synthesis of drugs and chemical compounds in the laboratory
 C3- Learn laboratory analysis methods to know the composition of chemical compounds
 C4- Preparing different medicines

D - General and rehabilitative skills (Other skills related to employability and personal development)

- D1-Doing scientific experiments
 D2-Acquiring the skill of preparing medicines
 D3-Giving students confidence by presenting scientific research
 D4-Acquiring the skill of identifying and classifying drugs

Course Structure

Week	Hours	Required learning outcomes	The name of the unit or topic	Education method	Evaluation method
1	2		Introduction in prodrug	Lectures	Quiz
2	2		Functional Groups in Prodrugs	Lectures	Quiz
3	2		Amines	Lectures	Quiz
4	2		BIOPRECURSOR PRODRUGS	Lectures	Quiz
5	2		CHEMICAL DELIVERY SYSTEMS	Lectures	Quiz
6	2		Polymeric prodrug	Lectures	Quiz
7	2		Design and synthesis of polymeric prodrug	Lectures	Quiz

8	1.5		Mid Examination		
9	2		Combinatorial Chemistry	Lectures	Quiz
10	2		Peptides and Peptoids	Lectures	Quiz
11	2		SUPPORTS AND LINKERS	Lectures	Quiz
12	2		Soluble polymers	Lectures	Quiz
13	2		Detection, purification, analysis	Lectures	Quiz
14	2		Mass spectrometry	Lectures	Quiz
15	2		"Binary" approach	Lectures	Quiz
16	2		HIGH-THROUGHPUT SCREENING	Lectures	Quiz

Resources

1. Required course books

1. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry: Delgado, JN, 1 remers WA, (Eds);10thed, 2004

2. Main references (sources)

Organic Chemistry by McMurry; latest edition.

a. Recommended books and references (scientific journals, reports)

b. electronic references, websites

Google for searching topics about practical pharmaceutical chemistry

COURSE DESCRIPTION FORM

Course description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, proving whether he has made maximum use of the available learning opportunities. It must be linked to the description of the program;

Educational institution

Ministry of Higher Education and Scientific Research

Scientific department	College of Pharmacy - Pharmaceutical Chemistry
Course name/code	Advanced Pharmaceutical Analysis / 521
Available forms of attendance	Official time
Season/year	Fifth stage – second semester /
Total study hours per week	5
Date of preparation of the description	
Course objectives	
Advanced Pharmaceutical Analysis: study spectroscopic methods and their use in identifying organic compounds	

Course outcomes, teaching and learning methods, and evaluation

A- Cognitive objectives

- A1- How to deal with chemical compounds
- A2- How to deal with scientific equipment
- A3- Learning using different scientific techniques
- A4- Know the factors that affect the stability, solubility and absorption of drugs
- A5- Knowledge of the mechanism of action of the drug and the relationship of the chemical composition to it
- A6- Know the methods used to prepare medicines

B - Skillful objectives

- B1- Gaining skill in preparing compounds and medicines
- B2- Acquisition of skill in the use of different methods in the manufacture and preparation of medicines
- B3- Gaining skill in how to deal with chemical compounds
- B4- Skill in writing scientific reports

Teaching and learning methods

- 1- Lectures
- 2- Perform practical experiments
- 3- Reading textbooks
- 4- Conducting scientific discussions

Evaluation methods

- 1- Oral and written exams
- 2- Practical exams after each experiment
- 3- Mid-term exam (theory)
- 4- Final exam (theory)

C- Emotional goals

C1- Knowing how to design drugs and chemical compounds
 C2- Knowledge of methods of synthesis of drugs and chemical compounds in the laboratory
 C3- Learn laboratory analysis methods to know the composition of chemical compounds
 C4- Preparing different medicines

D - General and rehabilitative skills (Other skills related to employability and personal development)

D1-Doing scientific experiments
 D2-Acquiring the skill of preparing medicines
 D3-Giving students confidence by presenting scientific research
 D4-Acquiring the skill of identifying and classifying drugs

Course Structure					
Week	Hours	Required learning outcomes	The name of the unit or topic	Education method	Evaluation method
1	3		UV / visible spectroscopy; Sample handling and instrumentation; Characteristic absorption of organic compounds;	Lectures	Quiz
2	3		Rules for calculation of lambda max and application; Application of UV/visible; spectroscopy; Conjugated system.	Lectures	Quiz
3	3		Infrared spectroscopy (theory and H-bonding effect)	Lectures	Quiz
4	3		Sampling techniques and interpretation of spectra; Characteristic group frequencies of organic compound	Lectures	Quiz
5	3		Application of IR spectroscopy; Problems and solutions.	Lectures	Quiz
6	3		Introduction, the nature of NMR absorption, chemical shifts and factors affecting them.	Lectures	Quiz
7	3		Introduction, the nature of NMR absorption, chemical	Lectures	Quiz

			shifts and factors affecting them.		
8	3		Introduction, the nature of NMR absorption, chemical shifts and factors affecting them. Information obtained from	Lectures	Quiz
9	3		Information obtained from NMR spectra, more complex spin-spin splitting patterns, application of H ¹ -NMR spectroscopy	Lectures	Quiz
10	3		Information obtained from NMR spectra, more complex spin-spin splitting patterns, application of H ¹ -NMR spectroscopy	Lectures	Quiz
11	3		C ¹³ -NMR spectroscopy: introduction and characteristics, DEPT C ¹³ -NMR spectroscopy.	Lectures	Quiz
12	3		Introduction and interpreting mass spectrum	Lectures	Quiz
13	3		Interpreting Mass spectra fragmentation patterns, Mass behavior of some common functional groups.	Lectures	Quiz
14	3		Interpreting Mass spectra fragmentation patterns, Mass behavior of some common functional groups.	Lectures	Quiz
15	3		Applications of mass spectroscopy for pharmaceutical analysis.	Lectures	Quiz
16	3		Final examination		

Resources

1. Required course books

1. Spectrometric Identification of Organic Compounds by Silverstein, Basler and Morrill, latest edition.

Organic Chemistry by McMurry; latest edition.

2. Main references (sources)

Modern Pharmaceutical Drug Analysis, by L. Zechmeister, latest edition.

a. Recommended books and references (scientific journals, reports)	Pharmaceutical Analysis Edited by DAVID C. LEE GlaxoSmithKline Steven age, UK and MICHAEL L. WEBB GlaxoSmithKline Steven age, UK.
b. Electronic references, websites	Google for searching topics about practical pharmaceutical chemistry