

Republic of Yemen
Ministry of Higher Education & Scientific Research
21 September University for Medicals and Applied Sciences



Faculty of Clinical Pharmacy

Bachelor of Pharm. D.

Course Specification of

Medicinal Chemistry-I

Course Code. (02.04.248)

2021-2022



T4: This Template is Developed and Approved by CAQA-Yemen, 2023

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
Prof. Ali G. Al-kaf	Prof..Mukhtar Al-Gharafi	Dr. -----	Dr. Abdulelah Thabet	Dr. Ali Alyahawi

I. General Information:

1.	Course Title:	Medicinal Chemistry-I			
2.	Course Code:	02.04.248			
3.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours
			Lecture	Tutorial/Seminar	Lab Clinical
		3	2		2 --
4.	Level/ Semester at which this Course is offered:	3 rd Year – Semester 1			
5.	Pre –Requisite (if any):	Organic chemistry			
6.	Co –Requisite (if any):	Pharmacology I			
7.	Program (s) in which the Course is Offered:	Bachelor of Clinical Pharmacy & Pharm D			
8.	Language of Teaching the Course:	English			
9.	Location of Teaching the Course:	Faculty of Clinical Pharmacy			
10.	Prepared by:				
11.	Date and Number of Approval by Council:				

II. Course Description:

This course is the first among (Medicinal chemistry) courses which are designed to provide knowledge and skills in chemistry of medicinal agents (drugs). The first part of the course deals an introduction to drugs including physicochemical properties of drug and drug metabolism while the second part deals with the chemical synthesis, structure activity relationship (SAR), pharmacophore molecules and metabolism of drugs affecting autonomic nervous system and cardiovascular system. The practical part provides the student the skill to identify the physicochemical, spectroscopic, chromatographic specification of the drugs under study The course is co-requisite with (Pharmacology & Therapeutics I) as both deals with the same medicinal agents.



III. Course Intended Learning Outcomes (CILOs) : Upon successful completion of the course, students will be able to:		Referenced PILOs	
A. Knowledge and Understanding:		I, P or M/A	
a1	Discuss the principles of medicinal chemistry of selected course compounds.	I	A3
a2	Describe the basic principles of mechanism of action for active groups in pharmaceutical chemistry.	I	A3
B. Intellectual Skills:			
b1	Design new medicinal compounds.	P	B2
b2	Compare qualifiedly and quantitatively between different medicinal compounds	P	B2.
C. Professional and Practical Skills:			
c1	Identify the name of chemical compound and derivatives or chemical modification effects.	P	C2
c2	Prepare properly new medicinal compounds according to chemical structure and biological activity.	P	C2
D. Transferable Skills:			
d1	Search efficiently for required medical information in professional medical references and sites.	A	D3
d2	Present clearly and effectively scientific topic in a tutorial, a staff meeting or the yearly scientific day.	A	D1, D2
I= Introduced, P=Practiced or M/A= Mastered/Advanced			

(A) Alignment of Course Intended Learning Outcomes (Knowledge and Understanding) to Teaching Strategies and Assessment Methods:			
Course Intended Learning Outcomes		Teaching Strategies	Assessment Strategies
a1	a1- Discuss the principles of medicinal chemistry of selected course compounds	- Lecture - Instructor – student Interactive - Office hour	- Exam - Assignment - Quiz
a2	a2- Describe the basic	Lecture	Exam



	principles of mechanism of action for active groups in pharmaceutical chemistry.	▪ Instructor – student Interactive ▪ Office hour	▪ Assignment ▪ Quiz
(B) Alignment of Course Intended Learning Outcomes (Intellectual Skills) to Teaching Strategies and Assessment Methods:			
	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
b1	b1- Design new medicinal compounds	▪ Lecture ▪ Instructor – student Interactive ▪ Exercises ▪ Solving Problem Methods	▪ Problem-Solving Exercises. ▪ Assignment ▪ Quiz
b2	b2- - Compare qualitatively and quantitatively between different medicinal compounds	▪ Lecture ▪ Instructor – student Interactive ▪ Exercises ▪ Solving Problem Methods	▪ Problem-Solving Exercises. ▪ Assignment ▪ Quiz
(C) Alignment of Course Intended Learning Outcomes (Professional and Practical Skills) to Teaching Strategies and Assessment Methods:			
	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
c1	C1- Identify the relationship between structure and activity according to different functional groups.	▪ Lecture ▪ Instructor – student Interactive ▪ Self-Learning	▪ Exam ▪ Assignment ▪ Quiz
c2	C2- Prepare properly new medicinal compounds according to chemical structure and biological activity.	▪ Lecture ▪ Instructor – student Interactive ▪ Self-Learning	▪ Exam ▪ Assignment ▪ Quiz
(D) Alignment of Course Intended Learning Outcomes (Transferable Skills) to Teaching Strategies and Assessment Methods:			
	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
d1	Search efficiently for required medical information in professional medical references and sites.	▪ Seminar ▪ Instructor–student Interactive ▪ Exercises	▪ Presentation
d2	Present clearly and effectively scientific topic in a tutorial, a staff meeting or the yearly scientific day.	▪ Seminar ▪ Instructor–student Interactive ▪ Exercises	Presentation



d3		▪	
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IV. Course Contents:

A. Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1	Medicinal chemistry roles and concepts	a1, b1, b2, c1	- definitions, brief history, roles in pharmacy - Basics of combinatorial chemistry and drug design : patent burst, synthesis of fragments, etc. - Pharmacophore and Physicochemical properties in relation to biological activity(SAR)	1	2
2	Drug-receptor interaction & Stereochemistry of drugs	a1,a2, b1,b2, d1	- binding and drug-receptor interaction : chemical bonding and biological activity - stereochemical aspects of drug action - isosterism and bioisosterism	2	4
3	chemistry of Drug metabolism	a1, a2, b1, b2,	- phase I reactions. Oxidation -reduction- hydrolysis. - phase II reactions - Types of conjugation - Factors affecting metabolism	2	4
4	Drugs acting on the autonomic nervous system	a1,a2, b1,b2,	Chemistry, structure-activity relationship, metabolism of drugs acting on sympathetic system. - Direct and indirect acting Sympathomimetic drugs. - Direct Sympatholytic drugs. - adrenergic blocking agents	1	2
5	Midterm Exam	a1,a2, b1,b2,		1	2

6	Drugs acting on the autonomic nervous system	a1,a2, b1,b2, d2	Chemistry, structure-activity relationship, metabolism of drugs acting on sympathetic system - Direct parasympathomimetics. - Indirectly parasympathomimetics. - Parasympatholytic drugs. - Drugs acting on autonomic ganglia. - Neuromuscular blocking agents	3	6
7	Drugs acting on Cardiovascular system.	a1, a2, b1, b2,	Chemistry, synthesis, chemical & common names, structure-activity relationship, metabolism of - Antihypertensive drug. - Antianginal and drugs for myocardial infarction. - Drugs for congestive heart failure - Antiarrhythmic drugs. - Diuretics. - Coagulant and anticoagulant drugs. - Drugs used in hyperlipidemia	4	8
8	GIT drugs	a1,a2, b1,b2,d2	Chemistry, synthesis, chemical & common names, structure-activity relationship, metabolism of: - Peptic ulcer and hyperacidity. - Drugs used for constipation. - Drugs used for diarrhoea.	2	4
9	Final Exam	a1,a2, b1,b2		1	2

Number of Weeks /and Units Per Semester	16	32
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B. Practical Aspect (Lab/Clinical) (if any):

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	Spectroscopy identification of: ANS drugs: Adrenaline	1	2	c1, c2
2	Spectroscopy identification of: ANS drugs: Atenolol.	1	2	c1, c2
3	Spectroscopy identification of: ANS drugs: Atropine	1	2	c1, c2
4	Spectroscopy identification of: ANS drugs: Neostigmine	1	2	c1, c2
5	Spectroscopy identification of: CVS drugs: furosemide	1	2	c1, c2
6	Spectroscopy identification of: CVS drugs: Amlodipine	1	2	c1, c2
7	Spectroscopy identification of: CVS drugs: Candesartan	1	2	c1, c2
8	Midterm Exam	1	2	c1, c2
9	Spectroscopy identification of: CVS drugs: digoxine	1	2	c1, c2
10	Spectroscopy identification of: CVS drugs: warfarin	1	2	c1, c2
11	Spectroscopy identification of: CVS drugs: Lidocaine	1	2	c1, c2
12	Spectroscopy identification of: CVS drugs: ondansetrone	1	2	c1, c2
13	Spectroscopy identification of: CVS drugs: omeprazole	1	2	c1, c2
14	- Synthesis of drugs.	1	2	c1, c2
15	- Purification of drugs.	1	2	c1, c2
16	- Final Exam	1	2	c1, c2
Number of Weeks /and Units Per Semester		16	32	

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Assignment 1	6 th	2.5	a1, a2, b1, b2,d1,d2
2	Assignment 2:	12 th	2.5	a 1, a 2, b 1, b2, c 1, c2,
Total				5

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignments	6th, 12th	5	5%	a1, a 2, b1, b2, c 1, c2, d 2
2	Practical Reports	2 nd -13 th	5	5%	a 1, a 2, c 1, c2, d2
3	Midterm Exam (Theory)	Week 7	15	20%	a 1, a 2, b 1, b2
	Midterm Exam (Practical)	Week 7	10	10%	c1, c2
4	Final Practical Exam	14 th	15	15%	c1, c2
5	Final Exam (Theory)	Week 16	50	50%	a1, a2, b1, b2
Total			100	100%	

IX. Learning Resources:

1- Required Textbook(s):

- 1- Wilson and Gisvold's. (2004).Textbook of Organic Medicinal and Pharmaceutical Chemist ed.-New York.;980
- 2- Al-kaf and Al-rahawi (2014). Textbook of Medicinal and Pharmaceutical Chemistry. -2nd .- Al-jil Al-jadid Publishers.Yemen;522

2- Essential References.

1. Al-kaf Ali Gamal (2017). Medicinal Chemistry. -3rd .-Hail centre Publisher.Yemen;383.
2. David A. Williams and Thomas L.Lemke.Foye's (2008). Principles of Medicinal Chemistry.6ed.-USA

3- Electronic Materials and Web Sites etc.

- 1 - www.pubmed.com
2. www.drugs.com
3. www.drugdesign.com/web/
4. <https://www.rti.org/service-capability/drug-discovery-and-development>

X. Course Policies: (Based on the Uniform Students' By law (2007))

1	Class Attendance: Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.
2	Tardiness: A student will be considered late if he/she is not in class after 10 minutes of the start time of class.
3	Exam Attendance/Punctuality: No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
4	Assignments & Projects: Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.
5	Cheating: Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	Forgery and Impersonation: Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	Other policies: The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.

Faculty of Clinical Pharmacy

Bachelor of Pharm. D.

Course Plan (Syllabus) of **Medicinal Chemistry-I**

Course Code. 02.04.248

I. Information about Faculty Member Responsible for the Course:						
Name of Faculty Member:		Office Hours				
Location & Telephone No.:						
E-mail:		SAT	SUN	MON	TUE	WED THU

2022- 2023

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
Prof. Ali G. Al-kaf	Prof..Mukhtar Al-Gharafi	Dr. -----	Dr. Abdulelah Thabet	Dr. Ali Alyahawi

II. Course Identification and General Information:

11.	Course Title:	Medicinal chemistry I			
12.	Course Code:	02.04.248			
13.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours
			Lecture	Tutorial/Seminar	Lab Clinical
		3	2		2 --
14.	Level/ Semester at which this Course is offered:	3 rd Level / 2 nd Semester			
15.	Pre –Requisite (if any):	Organic chemistry 1 &2			
16.	Co –Requisite (if any):	Pharmacology I			
17.	Program (s) in which the Course is Offered:	Bachelor of Clinical Pharmacy & Pharm D			
18.	Language of Teaching the Course:	English			
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11	Date and Number of Approval by Council:				

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IV. Course Intended Learning Outcomes (CILOs) :

Upon successful completion of the Course, student will be able to:

A. Knowledge and Understanding:

- | | |
|----|---|
| a1 | Discuss the principles of medicinal chemistry of selected course compounds. |
| a2 | Describe the basic principles of mechanism of action for active groups in pharmaceutical chemistry. |

B. Intellectual Skills:

- | | |
|----|--|
| b1 | Design new medicinal compounds. |
| b2 | Compare qualitatively and quantitatively between different medicinal compounds |

C. Professional and Practical Skills:

- | | |
|----|---|
| c1 | Identify the name of chemical compound and derivatives or chemical modification effects. |
| c2 | Prepare properly new medicinal compounds according to chemical structure and biological activity. |

D. Transferable Skills:

- | | |
|----|--|
| d1 | Search efficiently for required medical information in professional medical references and sites. |
| d2 | Present clearly and effectively scientific topic in, a staff meeting or the yearly scientific day. |

V. Course Contents:

A. Theoretical Aspect:

خطأ! لم يتم العثور على مصدر المرجع.

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1	Medicinal chemistry roles and concepts	a1, b1, b2, c1	- definitions, brief history, roles in pharmacy - Basics of combinatorial chemistry and drug design : patent burst, synthesis of fragments, etc. - Pharmacophore and Physicochemical properties in	1	2

			relation to biological activity(SAR)		
2	Drug-receptor interaction & Stereochemistry of drugs	a1,a2, b1,b2,	- binding and drug-receptor interaction : chemical bonding and biological activity - stereochemical aspects of drug action - isosterism and bioisosterism	2	4
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5	Midterm Exam	a1,a2, b1,b2,		1	2
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9	Final Exam	a1,a2, b1,b2		1	2
Number of Weeks /and Units Per Semester				16	32

B. Case Studies and Practical Aspect:

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	Spectroscopy identification of: ANS drugs: Adrenaline	1	2
2	Spectroscopy identification of: ANS drugs: Atenolol.	1	2
3	Spectroscopy identification of: ANS drugs: Atropine	1	2
4	Spectroscopy identification of: ANS drugs: Neostigmine	1	2
5	Spectroscopy identification of: CVS drugs: furosemide	1	2
6	Spectroscopy identification of: CVS drugs: Amlodipine	1	2
7	Spectroscopy identification of: CVS drugs: Candesartan	1	2
8	Midterm Exam	1	2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
9	Spectroscopy identification of: CVS drugs: digoxine	1	2
10	Spectroscopy identification of: CVS drugs: warfarin	1	2
11	Spectroscopy identification of: CVS drugs: Lidocaine	1	2
12	Spectroscopy identification of: CVS drugs: ondansetron	1	2
13	Spectroscopy identification of: CVS drugs: omeprazole	1	2
14	- Synthesis of drugs.	1	2
15	- Purification of drugs.	1	2
16	- Final Exam	1	2
Number of Weeks /and Units Per Semester		16	32

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	Spectroscopy identification of: ANS drugs: Adrenaline	1	2
2	Spectroscopy identification of: ANS drugs: Atenolol.	1	2
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7	Spectroscopy identification of: CVS drugs: Candesartan	1	2
8	Midterm Exam	1	2
9	Spectroscopy identification of: CVS drugs: digoxine	1	2
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No.	Tasks/ Experiments	Number of Weeks	Contact Hours
12	Spectroscopy identification of: CVS drugs: ondansetron	1	2
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14	Synthesis of drugs.	1	2
15	Purification of drugs.	1	2
16	Final Exam	1	2
Number of Weeks /and Units Per Semester		16	32

VI. Teaching Strategies of the Course:

- Lecture
- Instructor – student Interactive
- Exercises
- Presentation
- Office hours
- Seminar
- Assignment
- Self-Learning

VII. Assessment Methods of the Course:

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- Assignments
- Quiz
- Exam
- Oral Presentation

VIII. Assignments:

No.	Assignments	Week Due	Mark
1	Assignment 1	6 th	2.5
2	Assignment 2:	12 th	2.5



No.	Assignments	Week Due	Mark
Total			

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Assignment 1	6 th	2.5	a1, a2, b1, b2
2	Assignment 2:	12 th	2.5	a 1, a 2, b 1, b2, c 1, c2, d2
Total				5

IX. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignments	6th, 12th	5	5%	a1, a 2, b1, b2, c 1, c2,
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5	Final Exam (Theory)	Week 16	50	50%	a1, a2, b1, b2
Total			100	100%	

X. Learning Resources:

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- 1 - www.pubmed.com
2. www.drugs.com
3. www.drugdesign.com/web/
4. <https://www.rti.org/service-capability/drug-discovery-and-development>

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