



## Course Specification of Medicinal Chemistry IV

### I. Course Identification and General Information:

1	<b>Course Title</b>	Medicinal Chemistry IV				
2	<b>Course Number &amp; Code:</b>	Ph5912				
3	<b>Credit hours:</b>	<b>C.H</b>				<b>Total</b>
		<b>Th.</b>	<b>Pr.</b>	<b>Tr.</b>	<b>Seminar.</b>	
		2	2			3
4	<b>Study level/ semester at which this course is offered:</b>	5 <sup>th</sup> level /1 <sup>st</sup> semester				
5	<b>Pre –requisite (if any):</b>	Pharmaceutical analytical chemistry I&II and pharmaceutical organic chemistry I, II, & III and Medicinal Chemistry I				
6	<b>Co –requisite (if any):</b>	-				
7	<b>Program (s) in which the course is offered:</b>	Bachelor of Pharmacy				
8	<b>Language of teaching the course:</b>	English				
9	<b>The department in which the course is offered:</b>	Department of Medicinal Chemistry, Pharmaceutical Organic and Analytical Chemistry				
10	<b>Location of teaching the course:</b>	Faculty of Pharmacy- Sana`a university				
11	<b>Prepared by:</b>	Associate Prof. Tawfeek Ahmed Alobaidy				
12	<b>Date of approval:</b>					

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## II. Course description:

The course is concerned with the fundamental knowledge about the synthesis, metabolism, physicochemical properties and their effect on drug profile. The practical part will be devoted to tutorials and studying on the qualitative and quantitative analysis and synthesis of some drugs that is mentioned in this course.

## III. Intended learning outcomes (ILOs) of the course:

**At the end of this course the students should be able to:**

1. Recognize different classes of the antimalarial, antiprotozoal and anthelmintics, hypoglycaemic, antithyroid, hormones and vitamins.
2. Relate modification of groups in structure to their effect on biological activity
3. Illustrate the drug metabolism of studied drugs.
4. Characterize the chemistry and function of vitamins in the body.
5. Determine the functional groups and their effect on some pharmaceutical agents.
6. Identify the predicted moieties of drug structure that are metabolized
7. Diagram the schemes that relate the different nucleus with their different activity
8. Predict the role of some functional groups found in some drug structure.
9. Operate different pharmaceutical instrument and equipment in the lab.
10. Practice the quantitative estimation of some dosage form of studied drugs.
11. Carry out the qualitative analysis of some drugs.
12. Handle and dispose the chemical and pharmaceutical preparations safely and effectively.
13. Communicate and cooperate effectively with his colleagues and other specialist to prepare a scientific topic.
14. Implement writing and presentation skills to discuss the stereochemistry of some studied drugs.
15. Demonstrate critical thinking and decision making abilities.
16. Work effectively in a team to perform the required tasks in field of medicinal chemistry.

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#### IV. Intended learning outcomes (ILOs) of the course:

##### (A) Knowledge and Understanding:

Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **Knowledge and Understanding.**

Program Intended Learning Outcomes (Sub-PILOs) in: Knowledge and Understanding		Course Intended Learning Outcomes (CILOs) in: Knowledge and Understanding	
After completing this program, students would be able to:		After participating in the course, students would be able to:	
A1-	Recognize the principles of physical, chemical, clinical, social, behavioral, health and pharmaceutical sciences.	a1-	Recognize different classes of the antimalarial, antiprotozoal and anthelmintics, hypoglycaemic, antithyroid, hormones and vitamins.
A2-	Recognize the physicochemical properties, preparation, structure activity relationship (SAR), toxicity and the modern methods of analysis of various substances of chemical and natural products of therapeutic potential as well as the basic principle of drug discovery, design and development.	a2-	Relate modification of groups in structure to their effect on biological activity
		a3-	Illustrate the drug metabolism of studied drugs.
A3-	Describe the general cellular, biochemical and physiological aspects of human body and recognize the pharmacokinetics, pharmacodynamics, disease pathophysiology, and pharmacogenetic of therapeutic agents to provide pharmaceutical care and facilitate management of patient's medication, rationalize drug use and overall health needs.	a4-	Characterize the chemistry and function of vitamins in the body.

#### Teaching And Assessment Methods For Achieving Learning Outcomes:

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Alignment Learning Outcomes of Knowledge and Understanding to Teaching and Assessment Methods:			
Course Intended Learning Outcomes (CILOs) in Knowledge and Understanding After participating in the course, students would be able to:		Teaching strategies/methods to be used	Methods of assessment
a1-	Recognize different classes of the antimalarial, antiprotozoal and anthelmintics, hypoglycaemic, antithyroid, hormones and vitamins.	Lecture method , brainstorming , Computer based teaching and learning, group discussion and tutorial	Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam.
a2-	Relate modification of groups in structure to their effect on biological activity		
a3-	Illustrate the drug metabolism of studied drugs.		
a4-	Characterize the chemistry and function of vitamins in the body.		

(B) Intellectual Skills:	
Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: Intellectual skills	
Program Intended Learning Outcomes (Sub-PILOs) in Intellectual skills	Course Intended Learning Outcomes (CILOs) of Intellectual Skills
After completing this program, students would be able to:	After participating in the course, students would be able to:

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<b>B1-</b>	Consolidate the chemical, biochemical and physiological principles to construct the pharmacophores of the structure and their effect on the stability, pharmacokinetic and pharmacodynamic profiles of the drug.	<b>b1-</b>	Determine the functional groups and their effect on some pharmaceutical agents.
<b>B2-</b>	Categorize the synthetic and natural drugs according to their mechanism of action,	<b>b2-</b>	Identify the predicted moieties of drug structure that are metabolized
	systemic effect, therapeutic uses, contraindication and toxicity.	<b>b3-</b>	Diagram the schemes that relate the different nucleus with their different activity
		<b>b4-</b>	Predict the role of some functional groups found in some drug structure

### Teaching And Assessment Methods For Achieving Learning Outcomes:

#### Alignment Learning Outcomes of Intellectual Skills to Teaching Methods and Assessment Methods:

<i>Course Intended Learning Outcomes (CILOs) in Intellectual Skills.</i>		Teaching strategies/methods to be used.	<i>Methods of assessment</i>
After participating in the course, students would be able to:			
<b>b1-</b>	Determine the functional groups and their effect on some pharmaceutical agents.	Lecture method, Computer based teaching and learning Group Discussion, Problem solving sessions and brainstorming	Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam.
<b>b2-</b>	Identify the predicted moieties of drug structure that are metabolized		
<b>b3-</b>	Diagram the schemes that relate the different nucleus with their different activity		
<b>b4-</b>	Predict the role of some functional groups found in some drug structure		

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## (C) Professional and Practical Skills.

Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: Professional and Practical Skills

Program Intended Learning Outcomes (Sub- PILOs) in Professional and Practical Skills		Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills	
After completing this program, students would be able to:		After participating in the course, students would be able to:	
C1-	Operate different pharmaceutical equipments and instruments and use emerging technologies in design, synthesis, pre-formulation, formulation, packaging, storage and analysis of pharmaceutical products according to GLP, GSP and cGMP guidelines.	c1-	Operate different pharmaceutical instrument and equipment in the lab.
C2-	Handle and dispose chemicals and pharmaceutical preparations including radiopharmaceuticals safely and effectively.	c2-	Practice the quantitative estimation of some dosage form of studied drugs.
		c3-	Carry out the qualitative analysis of some drugs
C5-	Conduct research studies and utilize the results in different pharmaceutical fields.	c4-	Handle and dispose the chemical and pharmaceutical preparations safely and effectively.

### Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment Learning Outcomes of Professional and Practical Skills to Teaching and Assessment Methods:

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Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills After participating in the course, students would be able to:		Teaching strategies/methods to be used	Methods of assessment
c1-	Operate different pharmaceutical instrument and equipment in the lab.	Lecture method, Practical sessions and group discussion	Practical works, homework, practical exam and practical reports.
c2-	Practice the quantitative estimation of some dosage form of studied drugs.		
c3-	Carry out the qualitative analysis of some drugs		
c4-	Handle and dispose the chemical and pharmaceutical preparations safely and effectively.		

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## (D) General / Transferable Skills:

Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **General and Transferable skills**

Repu  
Mins  
and Scientific Research  
Sana'a University  
Faculty of Pharmacy  
Quality Assurance Unit

الجمهورية  
وزارة التعليم العالي والبحث العلمي  
جامعة صنعاء  
كلية الصيدلة  
وحدة ضمان الجودة

### Program Intended Learning Outcomes (PILOs) in General / Transferable skills

### Course Intended Learning Outcomes (CILOs) in General / Transferable skills

After completing the program, students would be able to:

After participating in the course, students would be able to:

d3- Develop financial, market management, writing, presentation and time management skills as well as creativity, critical thinking, problem solving and decision making abilities.

d1- Communicate and cooperate effectively with his colleagues and other specialist to prepare a scientific topic.

D5- Apply information and communication technology and working effectively in a team.

d2- Implement writing and presentation skills to discuss the stereochemistry of some studied drugs.

d3- Demonstrate critical thinking and decision making abilities.

d4- Work effectively in a team to perform the req tasks in field of medicinal chemistry.

## Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment Learning Outcomes of General and Transferable skills to Teaching and Assessment Methods.

### Course Intended Learning Outcomes (CILOs) in General and Transferable Skills

### Teaching strategies/methods to be used.

### Methods of assessment

After participating in the course, students would be able to:

d1- Communicate and cooperate effectively with his colleagues and other specialist to prepare a scientific topic.

Small group discussions, Tutorials, brainstorming and Practical sessions.

Homework, and reports.

d2- Implement writing and presentation skills to discuss the stereochemistry of some studied drugs.

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d3-	Demonstrate critical thinking and decision making abilities.		
d4-	Use available technology and other media to assist with communication as appropriate.		

## V. Course Content:

### 1 – Course Topics/Items:

#### a – Theoretical Aspect

Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Number of weeks	Contact hours
1.	<b>Antimalarial agents</b>	a1,a2,a3,a4, b2, d1,d2,	<ul style="list-style-type: none"> <li>- Life cycle of the parasite,</li> <li>- Naturally occurring Antimalarial agents</li> <li>- Quinolone derivatives,</li> <li>- Tetrahydrofolate synthesis inhibitors,</li> <li>- Biguinides,</li> <li>- polycyclic antimalarial agents</li> <li>- Miscellaneous compounds.</li> </ul>	1	2
2.	<b>Antiprotozoal Agents,</b>	a1 ,b1,b2,b3,b4, c1,c3,d2-4	<ul style="list-style-type: none"> <li>- 4-Amino quinolones,</li> <li>- Antibiotics,</li> <li>- Haloacetamides,</li> <li>- 8-Hydroxy quinolones,</li> <li>- Ipecac alkaloids,</li> <li>- 5-Nitro imidazoles,</li> <li>- Organo-arsenicals and</li> <li>- Miscellaneous.</li> </ul>	1	2
3.	<b>Anthelmintic and Antibilharzial Agents</b>	a3,b1,b2,b3,b4, d3-4	<b>Anthelmintic:</b> <ul style="list-style-type: none"> <li>- Phenols,</li> <li>- Piperazine and</li> <li>- Heterocyclic compounds</li> </ul>	2	4

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			<b>Antibilharzial:</b> - Nitrocompounds, - Thioxanthenones, - Miscellaneous compounds		
4.	<b>Diabetes mellitus, Insulin &amp; Antidiabetic agents</b>		- <b>Role of insulin</b> - <b>Diabetes mellitus</b> - <b>Insulin preprations - Oral</b> <b>hypoglycemic Drugs</b> 1] Sulphonylureas 2] Metaglinides 3] Biguanides 4] Thiazolidinediones 5] $\alpha$ -Glucosidase inhibitors 6] GLP-1 analogue agonist 7] Dipeptidyl peptidase-4 (dpp4) inhibitors 8] Bile acid sequestrant- Colesevelam 9] Bromocriptine 10] sodium-dependent glucose cotransporter 2 (SGLT2) 11] Glucagon-Like Peptide-1 (Glp-1) Receptor Agonists	1	2
5.		a1,a2,b2,b3,b4, c1	<b>Female Sex Hormones:</b> - Estrogen and - Progestrones)	2	4
		a1, a2a3,b1,b2,b3,b4, c1,c3,d1-4	<b>Male Sex Hormones</b> - Androgens, - Antiandrogens)	1	2

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	<b>Hormones:</b>	a2,a3,b1,b2,b3,b4, c1,c3	<b>Corticosteroids</b> - Glucocortisteroids and - Mineralocorticoids)	1	2
		a1 ,b1,b2,b3,b4, d1-4	Peptide, protein hormones and peptidomimetics	1	2
<b>6.</b>	<b>Mid Exam</b>	a1-3, b1-4		1	2
<b>7.</b>	<b>Thyroid hormones and antithyroid drugs</b>	a2,a3,b1,b2,b3,b4, c1,c3,d3	- Mechanism of thyroid hormones formation - Thyroid drugs Natural thyroid hormone preparations, Synthetic thyroid hormone - Anti-Thyroid Drugs Radioactive iodine, Potassium iodide:, Thioureylenes [Thioamide)	1	2
<b>8.</b>	<b>Vitamines</b>	a1,a2, a4 b1,b2,b3,b4,d1-4	- Water soluble viamines and - Fat soluble viamines	3	6
<b>9.</b>	<b>Final Exam</b>	a1-4, b1, b2		1	2
<b>Number of Weeks /and Units Per Semester</b>				<b>16</b>	<b>32</b>

<b>b - Practical Aspect</b>				
<b>Order</b>	<b>Tasks/ Experiments</b>	<b>CILOs (symbols)</b>	<b>Number of Weeks</b>	<b>Contact Hours</b>
<b>1</b>	<b>Assay of Hexamine in some formulated tab</b>	c1,c2 , c4	1	2
<b>2</b>	<b>Identification of Albendazole</b>	c1,c3 , c4	1	2

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3	Assay of Metronidazole	c1,c2 , c4	1	2
4	Assay of Metformine	c1,c2 , c4	1	2
5	Colorimetric determination of ethinylestradiol	c1,c2 , c4	1	2
6	Non-aqueous titration of Tamoxifen	c1,c2 , c4	1	2
7	Mid-Exam	<b>c1,c2, c3, c4</b>	1	2
8	Non-aqueous titration of Clomiphene	c1,c2 , c4	1	2
9	Spectrophotometric determination of Progesterone	c1,c2 , c4	1	2
10	Quantitative analysis of KI	c1,c2 , c4	1	2
11	Spectrophotometric determination of Cyanocobalamin inj.	c1,c2 , c4	1	2
12	Spectrophotometric determination of Riboflavin sodium phosphate	c1,c2 , c4	1	2
13	Qualitative analysis of vitamin c	c1,c3 , c4	1	2
14	Quantitative analysis of vitamin c	c1,c2 , c4	1	2
15	Qualitative analysis of Nicotinic acid	c1,c3 , c4	1	2
16	Final Exam	<b>c1-4</b>	1	2
<b>Number of Weeks /and Units Per Semester</b>			<b>16</b>	<b>32</b>

#### VI. A-Teaching strategies of the course:

Lecture method, Group Discussion, Problem solving sessions and Computer based teaching and learning, tutorials, brainstorming and Practical sessions.

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### b- Assessment Methods:

Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam Practical works, practical exam and practical reports.

### VII. Assignments:

No.	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Homework Assignments	a1, a2, a4, , b1-3, d1-4	Sporadic through the semester	10
2	Reports	c1-4, d1-4		

### I. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes (CILOs symbols)
1.	Attendance, Participation and reports	All Weeks	10	7%	a1-5, b1-4, d1-4
2.	Quizzes and Homework-assignments	Sporadic through the semester	10	7%	a1,a2, a4, b1-3, d1-4
3.	Attendance, Practical Reports	All Weeks	15	10%	c1-4
4.	Practical mid-semester exam	7 <sup>th</sup>	15	10%	c1-3
5.	Theoretical mid-semester exam	11 <sup>th</sup>	30	20%	a1-3, b1-4

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6.	Final Exam (theoretical)	16 <sup>th</sup>	50	33%	a1-4, b1-4
7.	Final Exam (practical)	16 <sup>th</sup>	20	13%	c1-4
<b>Total</b>			<b>150</b>	<b>100%</b>	

## II. Students' Support:

Office Hours/week	Other Procedures (if any)
Two contact hours per week	None

## III. Learning Resources:

### 1- Required Textbook(s) ( maximum two ).

- 1- John M. Beale, Jr. and John H. Block, 2011, "Text book of Organic Medicinal and Pharmaceutical Chemistry" 12th Edition, Wilson and Gisvold, Lippincott Williams and Wilkins, A Wolters Kluwer Company, Philadelphia.
- 2- Graham L. Patrick, 2013, "An Introduction to Medicinal Chemistry" 5<sup>th</sup> Edition, Oxford University Press Inc, New York.

### 2- Recommended Books and Reference Materials.

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	<p>1- Thomas Nogrady, Donald F. Weaver, 2005, Medicinal Chemistry A Molecular and Biochemical Approach edition, Oxford University Press, Inc., New York.</p> <p>2- Donald J. Abraham, "BURGER'S Medicinal Chemistry and Drug Discovery" 6<sup>th</sup> edition, A John Wiley and Sons, Inc, Virginia. 3- Thomas L. Lemke, Victoria F. Roche, David A. Willaiams and S. William Zito, 2008, "Foye's Principles of Medicinal Chemistry" 6<sup>th</sup>, Edition,, Lippincott Williams &amp; Wilkins, a Wolters Kluwer business, Philadelphia.</p> <p>4- Povl Krogsgaard-Larsen, Tommy Liljefors and Ulf Madsen, 2002 , "Textbook of Drug Design and Discovery" Third edition , Taylor &amp; Francis, London.</p> <p>5- K.-H. Hellwich · C. D. Siebert, 2006, "Stereochemistry Workbook" Springer-Verlag Berlin Heidelberg, Berlin.</p> <p>6- Lectures Notes and Practical Manual.</p>
<b>3- Electronic Materials and Web Sites etc.</b>	
	<p>1- <a href="http://www.chemaxon/marvin">http://www.chemaxon/marvin</a></p> <p>2 - <a href="http://www.webmolecules.com">http://www.webmolecules.com</a></p>

	<p>3-<a href="http://www.acdlabs.com">http://www.acdlabs.com</a></p> <p>4-PASS Prediction of Activity Spectra for Substance) (<a href="http://www.ibmh.msk.su/PASS">http://www.ibmh.msk.su/PASS</a>).</p>
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#### IV. Facilities Required:

<b>1 - Accommodation:</b>	<ul style="list-style-type: none"> <li>- Well-equipped lecture halls with data show facilities, whiteboards, net connection, etc.</li> <li>- Well-equipped laboratories with all required equipment and reagents.</li> </ul>
<b>2 - Computing resources:</b>	<ul style="list-style-type: none"> <li>- Computer laboratory with internet facilities.</li> </ul>

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## V. Course Improvement Processes:

### 1- Strategies for obtaining student feedback on effectiveness of teaching

- Student-based assessment of the effectiveness of teaching using a questionnaire designed by the Quality Assurance Unit at the end of the semester.
- Meeting with students and faculty (once per semester).

### 2- Other strategies for evaluation of teaching by the instructor or by the department.

- Assessment of the course syllabus and contents by the teachers using a questionnaire designed by the Quality Assurance Unit of the university at the end of the semester.
- Regular meeting and discussion of the course content between the Head of Department and the teaching staff of the course (for theory and practice).

### 3- Processes for improvement of teaching.

- Revision of the course specification and its teaching strategies every three academic years after consideration of all issues raised by the teachers and/or students during regular meetings and discussions.
- Exploring any possible defects in the course that might be encountered by the teaching staff and their mitigation in subsequent improved versions of course specification.

### 4- Processes for verifying standards of students' achievement

- Checking of a sample of students' work by an independent faculty member.
- Periodic exchange and check marking of a sample of students' assignments with a faculty member from another institution.
- Adoption of scoring rubrics to assess the students' achievement (both for ongoing or summative assessments).
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### 5- Procedures for periodically reviewing of course effectiveness and planning for improvement

- Student rating and feedback
- Peer rating and feedback
- Regular meeting of the Curriculum Committee of the faculty.

### 6- Course development plans

- Conducting regular workshops for the staff for improving their course specification skills.
- Regular revision of course specification and syllabus items.

## VIII. Course Policies: (including plagiarism, academic honesty, attendance etc)

The University Regulations on academic misconduct will be strictly enforced. Please refer to -----

### 1 Class Attendance:

- Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.

### 2 Tardy:

- Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.

### 3 Exam Attendance/Punctuality:

- Exam attendance is obligatory unless being excused by the department and faculty.
- Absence from assignments or exams will be dealt with according to the general policy of the university.

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4	<b>Assignments &amp; Projects:</b> <ul style="list-style-type: none"><li>Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator. ■</li><li>Projects: Not applicable.</li></ul>
5	<b>Cheating:</b> <ul style="list-style-type: none"><li>Punishment of cheating will be according to the general policy of the university in this respect.</li></ul>
6	<b>Plagiarism:</b> <ul style="list-style-type: none"><li>Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.</li></ul>
7	<b>Other policies:</b> <ul style="list-style-type: none"><li>General policies of the Students' Affairs of the University and the Quality Assurance Unit.</li></ul>

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## Course Plan of Medicinal Chemistry IV

### I- Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Tawfeek A. Al-Obaidy	Office Hours					
Location & Telephone No.	770507931	SAT	SUN	MON	TUE	WED	THU
E-mail	Tawfik_93@yahoo.com		2h				

### II- Course Identification and General Information:

1-	Course Title:	Medicinal Chemistry IV				
2-	Course Number & Code:	Ph5812				
3-	Credit hours:	C.H				Total
		Th.	Seminar	Pr.	F. Tr.	
		2	-	2		3
4-	Study level/year at which this course is offered:	5 <sup>th</sup> level / 1 <sup>st</sup> semester				
5-	Pre –requisite (if any):	Pharmaceutical analytical chemistry I&II , Pharmaceutical organic chemistry I,II&III and Medicinal Chemistry I				
6-	Co –requisite (if any):	-				
7-	Program (s) in which the course is offered	Bachelor of Pharmacy				
8-	Language of teaching the course:	English				
9-	System of Study:	Semesters				
10-	Mode of delivery:	Regular				

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11-	Location of teaching the course:	Faculty of Pharmacy- Sana`a university
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### III- Course description:

The course is concerned with the fundamental knowledge about the synthesis, metabolism, physicochemical properties and their effect on drug profile. The practical part will be devoted to tutorials and studying on the qualitative and quantitative analysis and synthesis of some drugs that is mentioned in this course.

### IV- Intended learning outcomes (ILOs) of the course:

**At the end of this course the students should be able to:**

1. Recognize different classes of the antimalarial, antiprotozoal and anthelmintics, hypoglycaemic, antithyroid, hormones and vitamins.
2. Relate modification of groups in structure to their effect on biological activity
3. Illustrate the drug metabolism of studied drugs.
4. Characterize the chemistry and function of vitamins in the body.
5. Determine the functional groups and their effect on some pharmaceutical agents.
6. Identify the predicted moieties of drug structure that are metabolized
7. Diagram the schemes that relate the different nucleus with their different activity
8. Predict the role of some functional groups found in some drug structure.
9. Operate different pharmaceutical instrument and equipment in the lab.
10. Practice the quantitative estimation of some dosage form of studied drugs.
11. Carry out the qualitative analysis of some drugs
12. Handle and dispose the chemical and pharmaceutical preparations safely and effectively.
13. Communicate and cooperate effectively with his colleagues and other specialist to prepare a scientific topic.
14. Implement writing and presentation skills to discuss the stereochemistry of some studied drugs.
15. Demonstrate critical thinking and decision making abilities.
16. Work effectively in a team to perform the required tasks in field of medicinal chemistry.

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## 17. Course Content:

### 1 – Course Topics/Items:

#### a – Theoretical Aspect

Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Week Due	Contact hours
1.	Antimalarial agents	a1,a2,a3,a4, b2, d1,d2,	<ul style="list-style-type: none"> <li>- Life cycle of the parasite,</li> <li>- Naturally occurring Antimalarial agents</li> <li>- Quinolone derivatives,</li> <li>- Tetrahydrofolate synthesis inhibitors,</li> <li>- Biguinides,</li> <li>- polycyclic antimalarial agents - Miscellaneous compounds.</li> </ul>	1	2
2.	Antiprotozoal Agents,	a1 ,b1,b2,b3,b4, c1,c3,d2-4	<ul style="list-style-type: none"> <li>- 4-Amino quinolones,</li> <li>- Antibiotics,</li> <li>- Haloacetamides,</li> <li>- 8-Hydroxy quinolones,</li> <li>- Ipecac alkaloids,</li> <li>- 5-Nitro imidazoles, -</li> <li>- Organo-arsenicals and -</li> <li>- Miscellaneous.</li> </ul>	2	2

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3.	<b>Anthelmintic and Antibilharzial Agents</b>	a3,b1,b2,b3,b4, d3-4	<b>Anthelmintic:</b> - Phenols, - Piperazine and - Heterocyclic compounds <b>Antibilharzial:</b> - Nitrocompounds, - Thioxanthenones, - Miscellaneous compounds	3,4	4
4.	<b>Diabetes mellitus, Insulin &amp; Antidiabetic agents</b>		- <b>Role of insulin</b> - <b>Diabetes mellitus</b> - <b>Insulin preparations - Oral hypoglycemic Drugs</b> 1] Sulphonylureas 2] Metaglinides 3] Biguanides 4] Thiazolidinediones 5] $\alpha$ -Glucosidase inhibitors 6] GLP-1 analogue agonist 7] Dipeptidyl peptidase-4 (dpp4) inhibitors 8] Bile acid sequestrant- Colesevelam 9] Bromocriptine 10] sodium-dependent glucose cotransporter 2 (SGLT2) 11] Glucagon-Like Peptide-1 (Glp-1) Receptor Agonists	5	2

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5.	Hormones:	a1,a2,b2,b3,b4, c1	<b>Female Sex Hormones:</b> - Estrogen and - Progesterones)	6,7	4
		a1, a2a3,b1,b2,b3,b4, c1,c3,d1-4	<b>Male Sex Hormones</b> - Androgens, - Antiandrogens)	8	2
		a2,a3,b1,b2,b3,b4, c1,c3	<b>Corticosteroids</b> - Glucocortisteroids and - Mineralocorticoids)	9	2
		a1 ,b1,b2,b3,b4, d1-4	Peptide, protein hormones and peptidomimetics	10	2
6.	Mid Exam	a1-3, b1-4		11	2
7.	Thyroid hormones and antithyroid drugs	a2,a3,b1,b2,b3,b4, c1,c3,d3	- Mechanism of thyroid hormones formation - Thyroid drugs	12	2
			Natural thyroid hormone preparations, Synthetic thyroid hormone - Anti-Thyroid Drugs Radioactive iodine, Potassium iodide:, Thioureylenes [Thioamide)		
8.	Vitamines	a1,a2, a4 b1,b2,b3,b4,d1-4	- Water soluble viamines and - Fat soluble viamines	13-15	6
9.	Final Exam	a1-4, b1, b2,b3,b4		16	2
Number of Weeks /and Units Per Semester				16	32

**b - Practical Aspect**

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Order	Tasks/ Experiments	CILOs (symbols)	Week Due	Contact Hours
1	Assay of Hexamine in some formulated tab	c1,c2 , c4	1	2
2	Identification of Albendazole	c1,c3 , c4	2	2
3	Assay of Metronidazole	c1,c2 , c4	3	2
4	Assay of Metformine	c1,c2 , c4	4	2
5	Colorimetric determination of ethinylestradiol	c1,c2 , c4	5	2
6	Non-aqueous titration of Tamoxifen	c1,c2 , c4	6	2
7	Mid-Exam	<b>c1,c2, c3, c4</b>	7	2
8	Non-aqueous titration of Clomiphen	c1,c2 , c4	8	2
9	Spectrophotometric determination of Progesterone	c1,c2 , c4	9	2
10	Quantitative analysis of KI	c1,c2 , c4	10	2
11	Spectrophotometric determination of Cyanocobalamine inj.	c1,c2 , c4	11	2
12	Spectrophotometric determination of Riboflavin sodium phosphate	c1,c2 , c4	12	2
13	Qualitative analysis of vitamin c	c1,c3 , c4	13	2
14	Quantitative analysis of vitamin c	c1,c2 , c4	14	2
15	Qualitative analysis of Nicotinic acid	c1,c3 , c4	15	2
16	Final Exam	<b>c1-4</b>	16	2

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Number of Weeks /and Units Per Semester	16	32
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### 18. A-Teaching strategies of the course:

Lecture method, Group Discussion, Problem solving sessions and Computer based teaching and learning, tutorials, brainstorming and Practical sessions.

### b- Assessment Methods:

Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam Practical works, practical exam and practical reports.

## VII. Assignments:

No.	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Homework Assignments	a1, a2, a4, 5b1, b1-3, d1-4	Sporadic through the semester	10
2	Reports	c1-4, d1-4		

## VI. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final	Aligned Course
				Assessment	Learning Outcomes (CILOs symbols)
8.	Attendance, Participation and reports	All Weeks	10	7%	a1-5, b1-4, d1-4

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9.	Quizzes and Homework-assignments	Sporadic through the semester	10	7%	a1,a2, a4, b1-3, d1-4
10.	Attendance, Practical Reports	All Weeks	15	10%	c1-4
11.	Practical mid-semester exam	7 <sup>th</sup>	15	10%	c1-3
12.	Theoretical mid-semester exam	11 <sup>th</sup>	30	20%	a1-3, b1-4
13.	Final Exam (theoretical)	16 <sup>th</sup>	50	33%	a1-4, b1-4
14.	Final Exam (practical)	16 <sup>th</sup>	20	13%	c1-4
<b>Total</b>			<b>150</b>	<b>100%</b>	

## VII. Students' Support:

Office Hours/week	Other Procedures (if any)
Two contact hours per week	None

## VIII. Learning Resources:

### 1- Required Textbook(s) ( maximum two ).

- 3- John M. Beale, Jr. and John H. Block, 2011, "Text book of Organic Medicinal and Pharmaceutical Chemistry" 12th Edition, Wilson and Gisvold, Lippincott Williams and Wilkins, A Wolters Kluwer Company, Philadelphia.

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- 4- Graham L. Patrick, 2013, "An Introduction to Medicinal Chemistry" 5<sup>th</sup> Edition, Oxford University Press Inc, New York.

## 2- Recommended Books and Reference Materials.

- 7- Thomas Nogrady, Donald F. Weaver, 2005, Medicinal Chemistry A Molecular and Biochemical Approach edition, Oxford University Press, Inc., New York.
- 8- Donald J. Abraham, "BURGER'S Medicinal Chemistry and Drug Discovery" 6<sup>th</sup> edition, A John Wiley and Sons, Inc, Virginia.
- 9- Thomas L. Lemke, Victoria F. Roche, David A. Willaiams and S. William Zito, 2008, "Foye's Principles of Medicinal Chemistry" 6<sup>th</sup>, Edition,, Lippincott Williams & Wilkins, a Wolters Kluwer business, Philadelphia.
- 10- Povl Krogsgaard-Larsen, Tommy Liljefors and Ulf Madsen, 2002 , "Textbook of Drug Design and Discovery" Third edition , Taylor & Francis, London.
- 11- K.-H. Hellwich · C. D. Siebert, 2006, "Stereochemistry Workbook" Springer-Verlag Berlin Heidelberg, Berlin.
- 12- Lectures Notes and Practical Manual.

## 3- Electronic Materials and Web Sites etc.

- 2- <http://www.chemaxon/marvin>
- 2 - <http://www.webmolecules.com>
- 3-<http://www.acdlabs.com>
- 4-PASSPrediction of Activity Spectra for Substance) (<http://www.ibmh.msk.su/PASS>).

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## IX. Facilities Required:

- Well-equipped lecture halls with data show facilities, whiteboards, 1 -  
**Accommodation:** net connection, etc.

	- Well-equipped laboratories with all required equipment and reagents.
<b>3 - Computing resources:</b>	- Computer laboratory with internet facilities.
<b>X. Course Improvement Processes:</b>	
<b>6- Strategies for obtaining student feedback on effectiveness of teaching</b>	
	<ul style="list-style-type: none"> <li>▪ Student-based assessment of the effectiveness of teaching using a questionnaire designed by the Quality Assurance Unit at the end of the semester.</li> <li>▪ Meeting with students and faculty (once per semester).</li> </ul>
<b>7 Other strategies for evaluation of teaching by the instructor or by the department.</b>	
	<ul style="list-style-type: none"> <li>▪ Assessment of the course syllabus and contents by the teachers using a questionnaire designed by the Quality Assurance Unit of the university at the end of the semester.</li> <li>▪ Regular meeting and discussion of the course content between the Head of Department and the teaching staff of the course (for theory and practice).</li> </ul>
<b>8- Processes for improvement of teaching.</b>	

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	<ul style="list-style-type: none"> <li>Revision of the course specification and its teaching strategies every three academic years after consideration of all issues raised by the teachers and/or students during regular meetings and discussions.</li> <li>Exploring any possible defects in the course that might be encountered by the teaching staff and their mitigation in subsequent improved versions of course specification.</li> </ul>
<b>9- Processes for verifying standards of students' achievement</b>	
	<ul style="list-style-type: none"> <li>Checking of a sample of students' work by an independent faculty member.</li> <li>Periodic exchange and check marking of a sample of students' assignments with a faculty member from another institution.</li> <li>Adoption of scoring rubrics to assess the students' achievement (both for ongoing or summative assessments).</li> </ul>
	<ul style="list-style-type: none"> <li>Regular follow-up of laboratory logbooks to assess the practical achievement of students.</li> </ul>
<b>10- Procedures for periodically reviewing of course effectiveness and planning for improvement</b>	
	<ul style="list-style-type: none"> <li>Student rating and feedback</li> <li>Peer rating and feedback</li> <li>Regular meeting of the Curriculum Committee of the faculty.</li> </ul>
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	<ul style="list-style-type: none"> <li>Conducting regular workshops for the staff for improving their course specification skills.</li> <li>Regular revision of course specification and syllabus items.</li> </ul>

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<b>The University Regulations on academic misconduct will be strictly enforced. Please refer to -----</b>	
<b>1</b>	<b>Class Attendance:</b> <ul style="list-style-type: none"><li>Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.</li></ul>
<b>2</b>	<b>Tardy:</b> <p>- Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.</p>
<b>3</b>	<b>Exam Attendance/Punctuality:</b> <ul style="list-style-type: none"><li>Exam attendance is obligatory unless being excused by the department and faculty.</li><li>Absence from assignments or exams will be dealt with according to the general policy of the university.</li></ul>
<b>4</b>	<b>Assignments &amp; Projects:</b> <ul style="list-style-type: none"><li>Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator. ▀</li><li>Projects: Not applicable.</li></ul>
<b>5</b>	<b>Cheating:</b> <ul style="list-style-type: none"><li>Punishment of cheating will be according to the general policy of the university in this respect.</li></ul>
<b>6</b>	<b>Plagiarism:</b> <ul style="list-style-type: none"><li>Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.</li></ul>
<b>7</b>	<b>Other policies:</b> <ul style="list-style-type: none"><li>General policies of the Students' Affairs of the University and the Quality Assurance Unit.</li></ul>

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الموصف