



Course Specification of Pharmaceutical Organic Chemistry III

I. Course Identification and General Information:

1	Course Title	Pharmaceutical Organic Chemistry III				
2	Course Number & Code:	Ph545				
3	Credit hours:	C.H				Total
		Th.	Pr.	Tr.	Seminar.	
		2	2			3
4	Study level/ semester at which this course is offered:	2 nd Level /2 nd semester				
5	Pre –requisite (if any):	General Pharmaceutical Chemistry & Pharmaceutical Organic 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	The department in which the course is offered:	Department of Medicinal Chemistry, Pharmaceutical Organic and Analytical Chemistry				
10	Location of teaching the course:	Faculty of Pharmacy-Sana`a University				
11	Prepared by:	Dr. Mokhtar A. Al-Ghorafy				
12	Date of approval:					

II. Course description:

This course provides students with the fundamental knowledge of stereochemistry and heterocyclic compounds including the nomenclatures, properties, synthesis, chemical reactions and the pharmaceutical application of these compounds. The practical part includes the preparation of some stereochemical models and synthesis of some heterocyclic compounds.

الموصف د. مختار الغرافي نائب العميد لشؤون الجودة ا.د. محمود البريهي رئيس القسم ا.م.د. توفيق العبيدي عميد الكلية د. خالد الشوية عميدة مركز التطوير وضمان الجودة ا.م.د. هدى العماد رئيس الجامعة ا.د. القاسم محمد عباس



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

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

1. Understand the basic principles of Stereochemistry of organic compounds.
2. Recognize the nomenclatures and the fundamental concepts of heterocyclic compounds.
3. Understand f the chemical and physical properties of heterocyclic compounds.
4. Outline the synthesis and chemical reactions of some heterocyclic compounds.
5. Recognize the importance and applications of stereochemistry and heterocyclic compounds in pharmacy fields.
6. Differentiate between chiral and non-chiral compounds
7. Suggest the suitable methods for synthesizing heterocyclic compounds of pharmaceutical interest.
8. Correlate the structure of heteroaromatic organic molecules with their effect on the biological activity.
9. Correlate the stereochemistry of pharmaceutical compounds to their importance in activity.
10. Use laboratory reagents adequately and safely
11. Synthesize and purify some heterocyclic compounds as starting material for synthesis of some drugs.
12. Design some models that facilitate the understanding of stereochemistry of organic compounds.
13. Collaborate effectively in groups to solve some problems encountered in pharmaceutical organic chemistry.
14. Search and evaluate the literature from different sources including the library, internet ...etc.
15. Manage, organize the time effectively and implement writing and presentation skills to explore the importance of aromatic compounds in pharmaceutical industry.

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:

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ا.م.د. هدى العماد

عميد الكلية
د. خالد الشوية

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ا.م.د. توفيق العبيدي

نائب العميد لشؤون الجودة
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A1-	Recognize the principles of physical, chemical, clinical, social, behavioral, health and pharmaceutical sciences.	a1-	Understand the basic principles of Stereochemistry of organic compounds
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-	Recognize the nomenclatures and the fundamental concepts of heterocyclic compounds.
		a3-	Understand the chemical and physical properties of heterocyclic compounds.
		a4-	Outline the synthesis and chemical reactions of some heterocyclic compounds.
		a5-	Recognize the importance and applications of Stereochemistry and heterocyclic compounds in pharmacy fields.

Teaching And Assessment Methods For Achieving Learning Outcomes:

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-	Understand the basic principles of Stereochemistry of organic compounds	Lecture method , Computer based teaching and learning, group discussion and tutorial	Oral Exam, Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam.
a2-	Recognize the nomenclatures and the fundamental concepts of heterocyclic compounds.		
a3-	Understand the chemical and physical properties of heterocyclic compounds.		
a4-	Outline the synthesis and chemical reactions of some heterocyclic compounds.		
a5-	Recognize the importance and applications of Stereochemistry and heterocyclic compounds in pharmacy fields.		

(B) Intellectual Skills:

الموصف د. مختار الغرافي نائب العميد لشؤون الجودة ا.د. محمود البريهي رئيس القسم ا.م.د. توفيق العبيدي عميد الكلية د. خالد الشوية عميدة مركز التطوير وضمان الجودة ا.م.د. هدى العماد رئيس الجامعة ا.د. القاسم محمد عباس



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:	
B1-	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.	b1-	Differentiate between chiral and non-chiral compounds
		b2-	Suggest the suitable methods for synthesizing heterocyclic compounds of pharmaceutical interest.
B2-	Categorize the synthetic and natural drugs according to their mechanism of action, systemic effect, therapeutic uses, contraindication and toxicity.	b3-	Correlate the structure of heteroaromatic organic molecules with their effect on the biological activity.
		b4-	Correlate the stereochemistry of pharmaceutical compounds to their importance in activity.
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:			
b1-	Differentiate between chiral and non-chiral compounds	Lecture method, Computer based teaching and learning Group Discussion, brainstorming and Problem solving sessions	Oral Exam, Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam.
b2-	Suggest the suitable methods for synthesizing heterocyclic compounds of pharmaceutical interest.		
b3-	Correlate the structure of heteroaromatic organic molecules with their effect on the biological activity.		



b4-	Correlate the stereochemistry of pharmaceutical compounds to their importance in activity.	
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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**

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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-	Use laboratory reagents adequately and safely.
C2-	Handle and dispose chemicals and pharmaceutical preparations including radiopharmaceuticals safely and effectively.	c2-	Synthesize and purify some heterocyclic compound starting material for synthesis of some drugs.
C5-	Conduct research studies and utilize the results in different pharmaceutical fields.	c3-	Design some models that facilitate the understanding of stereochemistry of organic compounds.

Teaching And Assessment Methods For Achieving Learning Outcomes:

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

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-	Use laboratory reagents adequately and safely.	Lecture method, Practical sessions and group discussion	Practical works, homework, practical exam and practical reports.
c2-	Synthesize and purify some heterocyclic compounds a starting material for synthesis of some drugs.		
c3-	Design some models that facilitate the understanding of stereochemistry of organic compounds.		

(D) General / Transferable Skills:

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د. مختار الغرافي



Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: General and Transferable skills			
Program Intended Learning Outcomes (PILOs) in General / Transferable skills		Course Intended Learning Outcomes (CILOs) in General / Transferable skills	
After completing this 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-	Collaborate effectively in groups to solve some problems encountered in pharmaceutical organic chemistry.
D5-	Apply information and communication technology and working effectively in a team.	d2-	Search and evaluate the literature from different sources including the library, internetetc
		d3-	Manage, organize the time effectively and implement writing and presentation skills to explore the importance of aromatic compounds in pharmaceutical industry
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-	Collaborate effectively in groups to solve some problems encountered in pharmaceutical organic chemistry.	Small group discussions, Tutorials and Practical sessions.	Homework, and reports.
d2-	Search and evaluate the literature from different sources including the library, internetetc		
d3-	Manage, organize the time effectively and implement writing and presentation skills to explore the importance of aromatic compounds in pharmaceutical industry		



I. Course Content:					
1 – Course Topics/Items:					
a – Theoretical Aspect					
Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Number of weeks	Contact hours
1.	Stereochemistry	a1, a5,b1,b4, d1-3.	<ul style="list-style-type: none"> - Definition, aim of study, classification - Chirality - Structural isomerism - Rotational isomerism - Geometrical isomerism - Optical isomerism - Effect of stereochemistry in medicine - Important of chrlality in drug design 	4	8
2.	Five membered heterocyclic compounds	a2-5, b2-3, d1-3	<ul style="list-style-type: none"> - Nomenclatures - Properties of Five membered heterocyclic containing One heteroatom (Pyrrole, Furan, Thiophen), Monocyclic five membered Rings Containing two heteroatoms (Imidazole, Oxazole, Thiazole, Pyrazole,.....) - Pharmaceutical importance of heterocyclic compounds 	3	6
3.	Mid Exam	a1-5, b1-4		1	2



4.	Six membered heterocyclic compounds	a2-5, b2-3, d1-3	<ul style="list-style-type: none"> - Nomenclatures - Properties of Monocyclic six membered Rings Containing One or More Heteroatoms) Pyrrolone, Pyrrolidine, Pyridine, Pyrimidine,.....) - Nomenclatures - Properties of Six-membered Heterocyclic Compounds with One Oxygen as a Heteroatom (-Pyran, - Pyran, - Pyrone, - Pyrone and Their Derivatives) - Pharmaceutical importance of heterocyclic compounds 	3	6
5.	Heterocyclic compounds containing two or more rings	a2-5, b2-3, d1-3	Nomenclatures of Bicyclic Rings Containing One or More Heteroatoms (Purine, Quinoline, Isoquinoline, Coumarin, Benzimidazole, acridine,Carbazole,.....), The physical and chemical characters -Pharmaceutical importance of heterocyclic compounds	3	6
6.	Seven membered heterocyclic compounds	a2-5, b2-3, d1-3	<ul style="list-style-type: none"> - Nomenclatures - The physical and chemical characters - Pharmaceutical importance of heterocyclic compounds 	1	2
7.	Final Exam	a1-5, b1-4		1	2
Number of Weeks /and Units Per Semester				16	32
b - Practical Aspect					
Order	Tasks/ Experiments	CILOs (symbols)	Number of Weeks	Contact Hours	
1.	Design stereochemical models for some organic compounds and drugs	c1,c3,d1-3	4	8	
2.	Synthesis of hexamine	c1-2,d1-3	1	2	
3.	Synthesis of Quinazolinone from Anthranilic Acid	c1-2,d1-3	2	4	
4.	Mid-Exam	c1-3	1	2	



5.	Synthesis of 1,4- Dihydro Pyridine from Ethyl Acetoacetate	c1-2,d1-3	1	2
6.	Synthesis of Antipyrine from Ethylacetoacetate	c1-2,d1-3	1	2
7.	Synthesis of Benzimidazole from Ortho-Phenylene Diamine	c1-2,d1-3	2	4
8.	Synthesis of 7-Hydroxy- 4-Methyl Coumarin from Resorcinol	c1-2,d1-3	2	4
9.	Revision	c1-3	1	2
10.	Final Exam	c1-3	1	2
Number of Weeks /and Units Per Semester			16	32

VII. a-Teaching strategies of the course:

Lecture method, computer based teaching and learning group discussion, brainstorming and Problem solving sessions, tutorial, Practical sessions and group discussion

b- Assessment Methods:

Oral Exam, 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
	Homework Assignments	a1, a2, a5, b1, b4, d1-3	Sporadic through the semester	10
	Reports	c1-3, d1-3		

VIII. 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, reports and quizzes	All Weeks	10	7%	a2,a3,a5, c1, b2,b3, d1-3



	Oral Tests and Homework assignments	Sporadic through the semester	10	7%	a1, a2, a5, b1, b4, d1-3
2	Attendance, Practical Reports and Practical mid-semester exam	8 th	30	20%	c1-3
3	Theoretical mid-semester exam	8 th	30	20%	a1-5, b1-4
5	Final Exam (theoretical)	16 th	50	33%	a1-5, b1-4
6	Final Exam (practical)	16 th	20	13%	c1-3
Total			150	100%	

IX. Students' Support:	
Office Hours/week	Other Procedures (if any)
Two contact hours per week	None

X. Learning Resources:	
1- Required Textbook(s) (maximum two).	
1-	A. R. Katritzky and J. M. Lagowski, 2010, 'The text Heterocyclic Chemistry' Third edition. Elsevier, Amsterdam.
2-	R. T. Morrison and R. N. Boyd. 2002. Organic Chemistry, 6 th edition, Pearson Prentice Hall of India Pvt. Ltd, New Delhi.
3-	Francis A. Carey and Richard J. Sundberg. 2001. Advanced Organic Chemistry; Part B: Reactions and Synthesis, 4 th edition, Wiley and Sons., Inc. New York.
4-	Michael Heidelberger. 1923. Advanced Laboratory Manual of Organic Chemistry, The chemical catalog company, inc. New York.
2- Recommended Books and Reference Materials.	

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1.	Louis D. Quin, 2010, "Fundamentals Of Heterocyclic Chemistry: Importance in Nature and in the Synthesis of Pharmaceuticals", John Wiley & Sons, Inc., Hoboken, New Jersey
2.	L. Finar,., 1963. Organic Chemistry: The Fundamental Principles, 4 th edition, longman green and company ltd. London.
3.	John McMurry. 2011, "Fundamentals of Organic Chemistry " Seventh Edition, Brooks/Cole 20 Davis Drive, Belmont.
4.	Jerry and March,., 2007,., Advanced Organic Chemistry ; reaction, mechanism and structure, 6 th edition, John Wiley & Sons, Inc., Hoboken, New Jersey
5.	Janice Gorzynski Smith. 2011,." Organic Chemistry", Third Edition, McGraw-Hill, a business unit of The McGraw-Hill Companies, New York.
6.	K.-H. Hellwich · C. D. Siebert, "Stereochemistry Workbook" 2006, Springer-Verlag Berlin Heidelberg , Berlin.
1. Lectures Notes and Practical Manual.	

3- Electronic Materials and Web Sites etc.

- 1- <http://www.chemaxon/marvin> 2-
www.orgsyn.org.
3-

XI. Facilities Required:

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1 - Accommodation:	<ul style="list-style-type: none"> - Well-equipped lecture halls with data show facilities, whiteboards, net connection, etc. - Well-equipped laboratories with all required equipment and reagents.
2 - Computing resources:	<ul style="list-style-type: none"> - Computer laboratory with internet facilities.
XII. Course Improvement Processes:	
1- Strategies for obtaining student feedback on effectiveness of teaching	
	<ul style="list-style-type: none"> ▪ 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.	
	<ul style="list-style-type: none"> ▪ 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.	
	<ul style="list-style-type: none"> ▪ 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	
	<ul style="list-style-type: none"> ▪ 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). ▪ Regular follow-up of laboratory logbooks to assess the practical achievement of students.



5 th Procedures for periodically reviewing of course effectiveness and planning for improvement	
	<ul style="list-style-type: none"> ▪ Student rating and feedback
	<ul style="list-style-type: none"> ▪ Peer rating and feedback ▪ Regular meeting of the Curriculum Committee of the faculty.
6- Course development plans	
	<ul style="list-style-type: none"> ▪ Conducting regular workshops for the staff for improving their course specification skills. ▪ Regular revision of course specification and syllabus items.

XIII. Course Policies: (including plagiarism, academic honesty, attendance etc)	
The University Regulations on academic misconduct will be strictly enforced. Please refer to -----	
1	Class Attendance: <ul style="list-style-type: none"> ▪ 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: <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>
3	Exam Attendance/Punctuality: <ul style="list-style-type: none"> ▪ 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.
4	Assignments & Projects: <ul style="list-style-type: none"> ▪ Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator. ▪ Projects: Not applicable.
5	Cheating: <ul style="list-style-type: none"> ▪ Punishment of cheating will be according to the general policy of the university in this respect.



6	<p>Plagiarism:</p> <ul style="list-style-type: none"> 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.
7	<p>Other policies:</p> <ul style="list-style-type: none"> General policies of the Students' Affairs of the University and the Quality Assurance Unit.

Course Plan of Pharmaceutical Organic Chemistry III

I- Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Dr. Mokhtar A. Al-Ghorafy	Office Hours					
Location & Telephone No.	770010749	SAT	SUN	MON	TUE	WED	THU
E-mail	Alghorafi2030@yahoo.com	2h					

II- Course Identification and General Information:					
1-	Course Title:	Pharmaceutical Organic Chemistry III			
2-	Course Number & Code:	Ph545			
3-	Credit hours:	C.H			C.H Th.
		Th.	Seminar	Pr.	
		2		2	2
4-	Study level/year at which this course is offered:	2 nd Level /2 nd semester			
5-	Pre –requisite (if any):	General Pharmaceutical Chemistry , Pharmaceutical Organic Chemistry I&II			
6-	Co –requisite (if any):	-			
7-	Program (s) in which the course is offered	Bachelor of pharmacy			
8-	Language of teaching the course:	English			

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 ا.د. القاسم محمد عباس ا.م.د. هدى العماد د.خالد الشوية ا.م.د.توفيق العبيدي ا.د. محمود البريهي د. مختار الغرافي



9-	System of Study:	Semesters
10-	Mode of delivery:	Regular
11-	Location of teaching the course:	Faculty of Pharmacy- Sana`a university

III- Course description:

This course provides students with the fundamental knowledge of stereochemistry and heterocyclic compounds including the nomenclatures, properties, synthesis, chemical reactions and the pharmaceutical

application of these compounds. The practical part includes the preparation of some stereochemical models and synthesis of some heterocyclic compounds.

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

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4. Outline the synthesis and chemical reactions of some heterocyclic compounds.
5. Recognize the importance and applications of stereochemistry and heterocyclic compounds in pharmacy fields.
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10. Use laboratory reagents adequately and safely
11. Synthesize and purify some heterocyclic compounds as starting material for synthesis of some drugs.
12. Design some models that facilitate the understanding of stereochemistry of organic compounds.
13. Collaborate effectively in groups to solve some problems encountered in pharmaceutical organic chemistry.
14. Search and evaluate the literature from different sources including the library, internet ...etc.
15. Manage, organize the time effectively and implement writing and presentation skills to explore the importance of aromatic compounds in pharmaceutical industry.



V- Course Content:					
1 – Course Topics/Items:					
a – Theoretical Aspect					
Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Week Due	Contact hours
1-	Stereochemistry	a1, a5,b1,b4, d13.	<ul style="list-style-type: none"> - Definition, aim of study, classification - Chirality - Structural isomerism - Rotational isomerism - Geometrical isomerism - Optical isomerism - Effect of stereochemistry in medicine - Important of chrality in drug design 	1-4	8
2-	Five membered heterocyclic compounds	a2-5, b2-3, d1-3	<ul style="list-style-type: none"> - Nomenclatures - Properties of Five membered heterocyclic containing One heteroatom (Pyrrole, Furan, Thiophen), Monocyclic five membered Rings Containing two heteroatoms (Imidazole, Oxazole, Thiazole, Pyrazole,.....) - Pharmaceutical importance of heterocyclic compounds 	5-7	6
3-	Mid Exam	a1-5, b1-4		8	2

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4-	Six membered heterocyclic compounds	a2-5, b2-3, d1-3	<ul style="list-style-type: none"> - Nomenclatures - Properties of Monocyclic six membered Rings Containing One or More Heteroatoms) Pyrroline, Pyrrolidine, Pyridine, Pyrimidine,.....) - Nomenclatures - Properties of Six-membered Heterocyclic Compounds with One Oxygen as a Heteroatom (-Pyran, - Pyran, - Pyrone, -Pyrone and Their Derivatives) - Pharmaceutical importance of heterocyclic compounds 	9-11	6
5-	Heterocyclic	a2-5, b2-3, d1-3	Nomenclatures of Bicyclic Rings Containing	12-14	6
	compounds containing two or more rings		One or More Heteroatoms (Purine, Quinoline, Isoquinoline, Coumarin, Benzimidazole, acridine,Carbazole,.....), The physical and chemical characters -Pharmaceutical importance of heterocyclic compounds		
6-	Seven membered heterocyclic compounds	a2-5, b2-3, d1-3	<ul style="list-style-type: none"> - Nomenclatures - The physical and chemical characters - Pharmaceutical importance of heterocyclic compounds 	15	2
7-	Final Exam	a1-5, b1-4		16	2
Number of Weeks /and Units Per Semester				16	32
b - Practical Aspect					
Order	Tasks/ Experiments	CILOs (symbols)	Week Due	Contact Hours	
11.	Design stereochemical models for some organic compounds and drugs	c1,c3,d1-3	1-4	8	
12.	Synthesis of hexamine	c1-2,d1-3	5	2	
13.	Synthesis of Quinazolinone from Anthranilic Acid	c1-2,d1-3	6,7	4	
14.	Mid-Exam	c1-3	8	2	

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د.خالد الشوية

رئيس القسم
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15.	Synthesis of 1,4- Dihydro Pyridine from Ethyl Acetoacetate	c1-2,d1-3	9	2
16.	Synthesis of Antipyrine from Ethylacetoacetate	c1-2,d1-3	10	2
17.	Synthesis of Benzimidazole from Ortho-Phenylene Diamine	c1-2,d1-3	11,12	4
18.	Synthesis of 7-Hydroxy- 4-Methyl Coumarin from Resorcinol	c1-2,d1-3	13,14	4
19.	Revision	c1-3	15	2
20.	Final Exam	c1-3	16	2
Number of Weeks /and Units Per Semester			16	32

VI- a-Teaching strategies of the course:

Lecture method, computer based teaching and learning group discussion, brainstorming and Problem solving sessions, tutorial, Practical sessions and group discussion

b- Assessment Methods:

Oral Exam, 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
	Homework Assignments	a1, a2, a5, b1, b4, d1-3	Sporadic through the semester	10
	Reports	c1-3, d1-3		

VIII- 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, reports and quizzes	All Weeks	10	7%	a2,a3,a5, c1, b2,b3, d1-3

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	Oral Tests and Homework assignments	Sporadic through the semester	10	7%	a1, a2, a5, b1, b4, d1-3
2	Attendance, Practical Reports and Practical mid-semester exam	8 th	30	20%	c1-3
3	Theoretical mid-semester exam	8 th	30	20%	a1-5, b1-4
5	Final Exam (theoretical)	16 th	50	33%	a1-5, b1-4
6	Final Exam (practical)	16 th	20	13%	c1-3
	Total		150	100%	

IX- Students' Support:

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

X- Learning Resources:

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

- 5- A. R. Katritzky and J. M. Lagowski, 2010, 'The text Heterocyclic Chemistry' Third edition. Elsevier, Amsterdam.
- 6- R. T. Morrison and R. N. Boyd. 2002. Organic Chemistry, 6th edition, Pearson Prentice Hall of India Pvt. Ltd, New Delhi.
- 7- Francis A. Carey and Richard J. Sundberg. 2001. Advanced Organic Chemistry; Part B: Reactions and Synthesis, 4th edition, Wiley and Sons., Inc. New York.
- 8- Michael Heidelberger. 1923. Advanced Laboratory Manual of Organic Chemistry, The chemical catalog company, inc. New York.

2- Recommended Books and Reference Materials.

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7.	Louis D. Quin, 2010, "Fundamentals Of Heterocyclic Chemistry: Importance in Nature and in the Synthesis of Pharmaceuticals", John Wiley & Sons, Inc., Hoboken, New Jersey
8.	L. Finar, ., 1963. Organic Chemistry: The Fundamental Principles, 4 th edition, longman green and company ltd. London.
9.	John McMurry. 2011, "
10.	Fundamentals of Organic Chemistry " Seventh Edition, Brooks/Cole 20 Davis Drive, Belmont. Jerry and March, . 2007, . Advanced Organic Chemistry ; reaction, mechanism and structure, 6 th edition, John Wiley & Sons, Inc., Hoboken, New Jersey
11.	Janice Gorzynski Smith. 2011, ." Organic Chemistry", Third Edition, McGraw-Hill, a business unit of The McGraw-Hill Companies, New York.
12.	K.-H. Hellwich · C. D. Siebert, "Stereochemistry Workbook" 2006, Springer-Verlag Berlin Heidelberg , Berlin.
2. Lectures Notes and Practical Manual.	
3- Electronic Materials and Web Sites etc.	
4-	http://www.chemaxon/marvin
5-	www.orgsyn.org .
6-	

XI- Facilities Required:

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1 - Accommodation:	<ul style="list-style-type: none"> - Well-equipped lecture halls with data show facilities, whiteboards, net connection, etc. - Well-equipped laboratories with all required equipment and reagents.
3 - Computing resources:	<ul style="list-style-type: none"> - Computer laboratory with internet facilities.
XII- Course Improvement Processes:	
6- Strategies for obtaining student feedback on effectiveness of teaching	
	<ul style="list-style-type: none"> ▪ 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).
7 Other strategies for evaluation of teaching by the instructor or by the department.	
	<ul style="list-style-type: none"> ▪ 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).
8- Processes for improvement of teaching.	
	<ul style="list-style-type: none"> ▪ 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.
9- Processes for verifying standards of students' achievement	
	<ul style="list-style-type: none"> ▪ 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). ▪ Regular follow-up of laboratory logbooks to assess the practical achievement of students.
10- Procedures for periodically reviewing of course effectiveness and planning for improvement	



	<ul style="list-style-type: none"> ▪ Student rating and feedback ▪ Peer rating and feedback ▪ Regular meeting of the Curriculum Committee of the faculty.
6- Course development plans	
	<ul style="list-style-type: none"> ▪ Conducting regular workshops for the staff for improving their course specification skills. ▪ Regular revision of course specification and syllabus items.

XIII- Course Policies: (including plagiarism, academic honesty, attendance etc)	
The University Regulations on academic misconduct will be strictly enforced. Please refer to -----	
1	Class Attendance: <ul style="list-style-type: none"> ▪ 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: <ul style="list-style-type: none"> ▪ 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.
4	Assignments & Projects: <ul style="list-style-type: none"> ▪ Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator. ▪ Projects: Not applicable.
5	Cheating: <ul style="list-style-type: none"> ▪ Punishment of cheating will be according to the general policy of the university in this respect.
6	Plagiarism: <ul style="list-style-type: none"> ▪ 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.



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Other policies:

- General policies of the Students' Affairs of the University and the Quality Assurance Unit.

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