



The University of Jordan

Accreditation & Quality Assurance Center

COURSE Syllabus

1	Course title	<i>Pharmaceutical Organic Chemistry</i> 1201215
2	Course number	1201215
3	Credit hours (theory, practical)	3 theory
	Contact hours (theory, practical)	3 theory
4	Prerequisites/corequisites	0303231
5	Program title	BSc pharmacy
6	Program code	
7	Awarding institution	The university of Jordan
8	Faculty	Pharmacy
9	Department	Pharmaceutical Sciences
10	Level of course	undergraduate
11	Year of study and semester (s)	Second semester of the second year
12	Final Qualification	BSc pharmacy
13	Other department (s) involved in teaching the course	-
14	Language of Instruction	English
15	Date of production/revision	31 January 2016

16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Prof. Dr. Yusuf Al-Hiari, BSc, MSc, PhD.

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17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Dr. Areej AbuHammad, PhD

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18. Course Description:

As stated in the approved study plan.

This course will cover the different organic functional groups carried by organic compounds and drugs, heterocycles and polycyclic compounds focusing on the biological role of these functional groups/nuclei in the structural formula of drugs. The topics will include the physical and chemical properties, chemical reactions, methods of preparation and mechanisms including pharmaceutical compound. Additionally, the course will confer the stereo-chemical aspects of these systems focusing on their effect on drugs activities.

A- Aims:

1. To provide students with the significance of different functional groups in organic compounds, and the importance of these functional groups in the structural formula of drugs.
2. Students should understand the chemical and physical behavior and synthetic reactions of different functional groups and their significance in pharmacy.
3. To illustrating different chemical reactions, methods of preparation and mechanisms for the different classes of organic compounds.
4. Introducing more advanced topics in pharmaceutical organic chemistry such as Medicinal Chemistry, Analytical Chemistry and SARS.
5. Provide students with the importance of the different organic nuclei from which most of the drugs consist, (Heterocyclic compounds and poly-cyclic compounds).
6. Students should understand the chemical and physical behavior of heteroaromatics (π -deficient and π -excessive systems) and their importance in pharmacy.
7. Student will be able to understand the importance of stereo-chemical aspects and their relationships with drugs activities

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to ...

A. Knowledge and Understanding: Student is expected to

A1- Understand the physical and chemical properties of functional groups, heterocycles and polycyclic compounds and their stereochemical aspects.

A2- Understanding the biological role of these systems in organic and pharmaceutical compounds

B. Intellectual Analytical and Cognitive Skills: Student is expected to

B1. Generally define and recognize different functional groups, hetero/polycyclic systems and apply this knowledge in preparing some usefully pharmaceutical chemicals, compounds and simple drugs including stereoisomers. Furthermore, he should apply his knowledge in analysis of drugs/compounds.

B2. Ability to apply this knowledge to explain drug behavior, solubility, oxidation, and stability. He should be also able to

understand the role of these groups/systems upon binding of a drug to his biological receptors.

C. Subject-Specific Skills: Student is expected to

C1. Acquire good theoretical skills regarding chemical and physical identification and classification of these basic organic functional groups, polycyclic and heterocyclic systems based on their chemical and physical behavior.

C2. Apply his knowledge in synthesis simple drugs and organic compounds through knowledge gained within lectures and assignments, and to utilizing the concept of functional groups incorporation, heteratom and stereochemistry in pharmaceutical drugs as tools for improving the biological activity

D. Transferable Key Skills: Students is expected to

D1. Work within a team to fulfill course library requirements, and to share, discuss and express ideas while working in group discussion sessions .

D2. Gaining some electronic and internet experience while answering some problems through visiting selected web sites related to organic chemistry and preparing assignments using internet, and PC software like drawing software.

D3. Develop problem solving experience while attempting finding solutions (method of preparation) for certain pharmaceutically usefully organic compounds.

Competencies:

1.1 Obtaining and maintaining medications

1.1.3 Recognize and follow proper storage conditions of medicines

1.3 Extemporaneous compounding

1.3.1 Characterize different dosage forms of medicines and their proper usage

1.4 Packaging and labeling of medication

1.4.1 Package medicines properly to ensure their stability, safety and patient accessibility

1.4.2 Label dispensed medicines with all necessary information and instructions

1.5 Patient counseling

1.5.1 Advise patients on proper storage, usage and adherence of dispensed medicines

1.5.2 Identify over-the-counter medicines and advise patients on their selection and usage

1.5.3 Advise patients about the proper use of medical devices and other non-medicinal pharmaceutical products

2.2 Fundamentals of drug therapy

2.2.1 Recognize pharmacological classes of drugs

2.2.2 Identify different routes of administration of medicines

2.2.3 Identify indications, side effects and contraindications of medicines

2.2.4 Identify the main mechanisms of action of drugs

2.2.5 Recognize the principles of drug safety and efficacy evaluation

2.5 Monitoring therapeutic outcomes

2.5.2 Identify drug-drug and drug-food interactions of medicines

3 Pharmaceutical Industry

3.1 Formulation design and development

3.1.1 Identify physiochemical properties of drug substances

3.1.3 Characterize various pharmaceutical dosage forms

3.4 Analysis and stability evaluation

3.4.1 Identify the principles of stability testing and shelf-life determination

3.4.2 Identify analytical method development and validation used in pharmaceutical analysis

20. Topic Outline and Schedule:

1.					
Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
1- Organic Functional groups		Both Parallel classes			
*Alcohols and phenols	1-2	Both Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,2,3
*Ethers Epoxides and Organo-Sulphur compounds	3	Both Parallel classes	A1-2, B1, C-1	Exams, Quizzes	1,2
*Aldehydes and Ketones	4-5	Both Parallel classes	A1-2, B1, C-1	Exams, Quizzes	1,3
*Carboxylic Acids and Derivatives.	5-6	Both Parallel classes	A1-3, B1, C1	Exams, Quizzes	1,2,3
*Amino and Nitro Compounds	7	Both Parallel classes	A1-3, B1, C1	Exams, Quizzes, assignments	1,3
<i>Quiz 1</i>	7		A1-3, B1-2, C1-2, D1-3	Problem solving, internet based questions	
<i>Midterm Exam</i>	8				
2- Heterocyclic Compounds		Both	A1-3, B1-2, C1-2, D1-3	Exams, Quizzes	1,4
A-π-Deficient Hetero aromatic Compounds	8	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
* Introduction	8	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
*Chemical/Physical Properties	8	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
*Synthesis of Pyridines and their Fused Analogues	9	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,3,4
*Diazines and Triazines	10	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
B-π-Excessive Hetero aromatic Compounds		Parallel classes	A1-3, B1-2, C1-2, D1-3	Exams, Quizzes	1,4
* Introduction	10	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
*Chemical/Physical Properties	11	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
*Synthesis	12	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
*Azoles	12	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,4
3-Polycyclic		Parallel classes	A1-2, B1-2, C1-	Exams, Quizzes	1,3,4

Compounds			2		
*Naphthalenes, Anthracenes, Anthracenes	13	Parallel classes	A1-3, B1-2, C1-2, D1-3	Exams, Quizzes	1,3,4
Assignment + Quiz	13	Parallel classes	A1-3, B1-2, C1-2, D1-3	Oral discussion and group discussion	
*Miscellaneous Poly-aromatic Nuclei	14	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,3,4
4-Stereochemistry and Drugs	14	Parallel classes	A1-3, B1-2, C1-2, D1-3	Exams, Quizzes	1,3,4
*stereochemistry principles and concepts	15	Parallel classes	A1-2, B1, C1	Exams, Quizzes	1,2,4
*Stereochemical aspects in Drugs	15	Parallel classes	A1-3, B1-2, C1-2, D1-3	Exams, Quizzes	1,2,4
Final Exam	16				

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

ILO/s	Learning Methods	Evaluation Methods
A1-2, B1, C1	Lectures and Discussions	Exam and Quizzes
B2, C1-2	Assignment, oral discussion, and short questions	Web-based or library based short questions and Quizzes, Oral discussion, Computer aided learning sessions /programs
C1-2, D1-3	Assignments and group discussion	Oral group discussion and Assignments (using internet and PC software)

Learning skills:

1. Critical thinking
2. Digital literacy
3. Problem-solving skills
4. Self-directed learning

22. Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

- Exams
- Quizzes
- Assignments/short reports: Library based, Internet based projects
- Short questions: critical thinking and self-oriented learning
- Oral discussion and Computer aided learning (softwares)

Course Requirements, assignment:

- Part A; library based: Students should submit a detailed assignment related to amino functional group that used in drugs, with detailed discussion of the physical, chemical properties of this group; Nomenclature, examples, the synthetic reactions involved and preparation.
- Part B; internet based: the student must search the internet for a drug has amino group explaining the role of this group in the selected drugs, (the drug may be example of free amine or heterocyclic amine). The student must the IUPAC name of drug/ring and functional group and their rule in the activity. He must illuminate the physical/chemical properties of the selected drug, pharmacology, synthesis and the structure activity relationship and correlate this to the functional groups within the drug.

23. Course Policies:

A- Attendance policies:

Attendance: Mandatory.

First warning – with 5 absences

Last warning – with 6 absences

Disqualified and Failing in the subject – with 6 absences (15% permissible absences with justification)

B- Absences from exams and handing in assignments on time:

Will result in zero achievement without medical excuse.

Certified health report or other significant excuse is approved by lecturer and the student set for MidMakeup exam within same semester.

Certified health report or other significant excuse is approved by dean for final exam and the student set for final-Makeup exam within next semester.

C- Health and safety procedures:

Not applicable

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All these matters follows university regulations and rules:

The participation, the commitment of cheating will lead to applying all following penalties together

- 1) Failing the subject he/she cheated at
- 2) Failing the other subjects taken in the same course
- 3) Not allowed to register for the next semester. The summer semester is not considered as a semester

E- Grading policy:

Evaluation	Point %	Date
Midterm Exam	40	8 th week
Assignments:	10	
Assignments/reports 1	5	7 th Week
Quizzes, short question	5	13 th Week, continuous process
Final Exam	50	15-16 th week
Total	100	

F- Available university services that support achievement in the course:

- Highly equipped faculty/university classrooms: Overhead projectors, Data show, Smart-boards, writing boards
- Fast internet connection and network
- Computer halls for students only
- Library: Provides updated books, references, encyclopaedias, electronic resources and good collections of data bases and full text papers

24. Required equipment:

- Data show
- Overhead projectors
- writing boards
- internet connection

25. References:

A- Required book (s), assigned reading and audio-visuals:

- 1) Organic Chemistry, John E. McMurry; 8th edition 2012 or latest edition.
- 2) Foundation of Molecular Pharmacology "Pharmaceutical and Medicinal Chemistry", Vol., J.B. Stanlake, 1st edition, 1979, 2^{ed} edition 2005.

B- Recommended books, materials, and media:

- 3) Organic Chemistry, Robert T. Morrison, Robert N. Boyd, 6th ed, 1992.
- 4) Heterocyclic chemistry, by J.A. Joule, K. Mills and G.F. Smith. (1995 any edition)

26. Additional information:

This course is taught as parallel classes:
Section 1: Dr. Yusuf Al-Hiari: S, T, T 12-1
Section 2: Dr. Areej AbuHammad: M,W 12;30-2

Name of Course Coordinator: Prof. Dr. Yusuf M. Al-Hiari; Signature: ----- Date: 31 Jan 2016

Head of curriculum committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: ----- -Signature: -----

Copy to:

Head of Department
Assistant Dean for Quality Assurance
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