

The University of Jordan

Faculty: Pharmacy **Department: Pharmaceutical Sciences**
Program: BSc and PharmD. **Academic Year/ Semester: 2013/2014, 1st**

Pharmaceutical Organic Chemistry (1201215)

Credit hours	3	Level	Second year	Pre-requisite	0303231
Coordinator/ Lecturer	Prof. Dr. Ali M. Qaisi (Coordinator) Prof. Dr. Yusuf Al-Hiari and Dr. Arej Abohammad (Lecturers)	Office number	317 313	Office phone	23308, 23292
Course website		E-mail	amqaisi@ju.edu.jo , hiary@ju.edu.jo	Place	Pharmacy halls

Office hours					
Day/Time	Sunday	Monday	Tuesday	Wednesday	Thursday
Prof. Dr. Ali M. Qaisi					
Prof. Dr. Yusuf al-Hiari	1-2	1-2	1-2	1-2	1-2
Dr. Arej Abuhammad					

Course Description

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.

Learning Objectives

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

Intended Learning Outcomes (ILOs):

Successful completion of the course should lead to the following outcomes:

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 and practical 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 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 answering preparing assignments using internet, and PC.

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

ILOs: Learning and Evaluation Methods

ILO/s	Learning Methods	Evaluation Methods
A. Knowledge and Understanding	Lectures and Discussions	Exam and Quiz
B. Intellectual Analytical and Cognitive Skills	Lectures and oral discussion	Exam, Quiz
C. Subject-Specific Skills	Lectures, Discussions, and Assignments, homework , library work	Exam, Quiz, and Assignments, library work, Computer aided learning sessions
D. Transferable Key Skills	Assignments and group discussion	Quiz and Assignments (using internet and PC software)

Course Contents

Content	Reference	Week	ILO/s
1- Organic Functional groups			
* Alcohols and phenols	1,2,3	1-2 (7 lectures)	A-D
* Ethers Epoxides and Organo-Sulphur compounds	1,2	3 (3lectures)	A-D
* Aldehydes and Ketones	1,3	4-5 (4lectures)	A-D
* Carboxylic Acids and Derivatives.	1,2,3	5-6 (5 lectures)	A-D
* Amino and Nitro Compounds	1,3	7 (3 lectures)	A-D
Assignment 1		7	C&D
Midterm Exam		8	
2- Heterocyclic Compounds			
A- π-Deficient Hetero aromatic Compounds	1,4		
* Introduction	1,4	8 (1 Lecture)	A-D
* Chemical/Physical Properties	1,4	8 (2 Lecture)	A-D
* Synthesis of Pyridines and their Fused Analogues	1,3,4	9 (3 Lecture)	A-D
* Diazines and Triazines	1,4	10 (2 Lecture)	A-D
B- π-Excessive Hetero aromatic Compounds			
* Introduction	1,4	10 (1 Lecture)	A-D
* Chemical/Physical Properties	1,4	11 (2 Lecture)	A-D
* Synthesis		11-12 (3 lectures)	A-D
* Azoles	1,4	12 (1 Lecture)	A-D
3- Polycyclic Compounds			

* Naphthalenes, Anthracenes, Anthracenes	1,4	13 (3 Lecture)	A-D
Assignment 2 + Quiz		13	C&D
*Miscellaneous Poly- aromatic Nuclei	1,4	14 (2 Lecture)	A-D
4- Stereochemistry and Drugs			
*stereochemistry principles and concepts	1,4	14-15 (2 Lecture)	A-D
* Stereochemical aspects in Drugs	1,4	15-16 (2 Lecture)	A-D
Final Exam			

Learning Methodology

- Lectures, Discussion,
- Assignments, Library Work and quizzes
- Internet based projects, new software
- Computer aided learning (self-reading sessions)

Projects and Assignments

- 1- Students should submit a detailed scheme for multi-step synthesis of known compound or drug based on Knowledge and Understanding gained within the course. He should be able to show possible routes of synthesis, type of reactions, IUPAC names of starting material and derivatives and finally develop the ability to deduce different possible side reactions and side products. (team work and discussion)
- 2- Each student must search the internet for a drug that contains the heterocyclic nuclei with his functional group explaining the names of ring and functional group and their role in the activity. He must talk about 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.

Evaluation

Evaluation	Point %	Date
Midterm Exam	30	To be assigned
Quizzes and Assignments:	20	
Assignments 1	10	7 th Week
Assignments 2	5	13 th Week
Quiz 1 (in lecture)	5	13 th Week
Final Exam	50	To be assigned

Main Reference/s:

Text Book:

- 1) Foundation of Molecular Pharmacology “Pharmaceutical and Medicinal Chemistry”, Vol., J.B. Stanlake.

References:

- 2) Organic Chemistry, Morrissen and Boyed
- 3) Organic Chemistry, McMurry
- 4) Heterocyclic chemistry, by J.A. Joule and G.F. Smith. (any edition)