

Course Plan for Bachelor Program - Study Plan Development and Updating Procedures/ Pharmacy Department	QF02/0408-4.0E
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Study Plan No.	2021/2022	University Specialization	Bachelor of Pharmacy
Course No.	0201364	Course Name	Chemistry of Natural Products
Credit Hours	3	Prerequisite *Co-requisite	Instrumental Analysis + Medicinal Chemistry 1
Course Type	☐ Mandatory University Requirement ☐ University Elective Requirement	☐ Faculty Mandatory Requirement ☐ Support course family requirements	☒ Mandatory Requirement ☐ Elective Requirement
Teaching Style	☐ Full Online Learning	☐ Blended Learning	☒ Traditional Learning
Teaching Model	☐ 2 Synchronous: 1 Asynchronous	☐ 2 Face to Face: 1 Synchronous	☒ 3 Traditional

Faculty Member and Study Divisions Information (to be filled in each semester by the subject instructor)

Faculty Member and Study Divisions Information (to be filled in each semester by the subject instructor)					
Name	Academic rank	Office No.	Phone No.	E-mail	
Office Hours (Days/Time)					
Division number	Time	Place	Number of Students	Teaching Style	Approved Model
				Traditional Learning	3 Traditional

Brief Description

This course is designed to provide pharmacy students with a comprehensive understanding of natural products as a foundation for drug discovery and development. It emphasizes the importance of understanding their biosynthetic origins and their distribution in plants and microorganisms as natural sources of bioactive compounds. The course explores the classification and biosynthetic pathways of primary and secondary metabolites, with a focus on their structural diversity and biological functions. Limited emphasis is placed on the therapeutic applications of natural products and their relevance to modern pharmaceutical science.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	Medicinal Natural Products: A Biosynthetic Approach, Paul M. Dewick, 2009 (3 rd Ed), John Wiley & Sons, ISBN:978-0-470-74168-9			
Supportive Learning Resources (Books, databases, periodicals, software, applications, others)	- Fundamentals of Pharmacognosy and Phytotherapy. Michael Heinrich, Joanne Barnes, Jose Prieto-Garcia, Simon Gibbons, Elizabeth Williamson. 2018, 3rd edition, Elsevier. - Trease and Evans Pharmacognosy. William C. Evans. 2009, 16th edition, Elsevier.			
Supporting Websites				
The Physical Environment for Teaching	☒ Classroom	☐ Labs	☐ Virtual Educational Platform	☐ Others
Necessary Equipment and				

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Software	
Supporting People with Special Needs	
For Technical Support	E-Learning & Open Educational Resources Center. Email: ellearning@zuji.edu.jo ; Phone: +962 6 429 1511 ext. 425/362.

Course learning outcomes (K= Knowledge, S= Skills, C= Competencies)

No.	Course Learning Outcomes	The Associated Program Learning Output Code
Knowledge		
K1	Classify natural products according to their biosynthetic origin, including differentiating between primary and secondary metabolites.	MK2
K2	Explain the principles and mechanisms of the major biosynthetic pathways.	MK2
Skills		
S1	Analyze the chemical building blocks and biosynthetic logic behind the structural diversity of natural products.	MS4
S2	Compare different extraction, separation, and purification methods used for the isolation of natural products.	MS4
S3	Interpret complex natural product structures in the context of their biosynthetic origin.	MS4
S4	Relate the structure of natural products to their pharmacological or therapeutic applications through representative examples.	MS4
Competencies		

Mechanisms for Direct Evaluation of Learning Outcomes

Type of Assessment / Learning Style	Fully Electronic Learning	Blended Learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm Exam	30%	30%	30%	0%
Participation / Practical Applications	0	0	30%	60%
Asynchronous Interactive Activities	30%	30%	0	0
Final Exam	40%	40%	40%	40%

Note: Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

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Schedule of Simultaneous / Face-to-Face Encounters and their Topics

Week	Subject	Learning Style*	Reference **
1-2	Introduction to natural products in drug discovery and development	Lecture	Handouts from different resources
3	Primary and secondary metabolism The building blocks and the construction mechanisms.	Lecture	Chapter 2 (7-38)
4	Acetate pathway: Fatty acids and Triglycerides	Lecture	Chapter 3 (39-52)
5	Acetate pathway: Macrolides	Lecture	Chapter 3 (66-68)
6	Acetate pathway: Aromatic polyketides	Lecture	Chapter 3 (99-130)
7	Mevalonate pathway: Monoterpenes and sesquiterpenes	Lecture	Chapter 5 (187-222)
8	Mevalonate pathway: Diterpenes, triterpenes and tetraterpenes	Lecture	Chapter 5 (241-305)
9-10	Shikimate pathway: Benzoic acids derivatives	Lecture	Chapter 4 (137-147)
11-12	Shikimate pathway: Phenylpropanoids derivatives	Lecture	Chapter 4 (148-177)
13-14	Alkaloids: Ornithine and lysine derived and nicotinic acid derived	Lecture	Chapter 6 (311-331)
15	Alkaloids: phenylalanine, tyrosine derived and tryptophan derived	Lecture	Chapter 6 (336-394)
16	Final Exam		

* Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.

** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.

Schedule of Asynchronous Interactive Activities (in the case of e-learning and blended learning)

Week	Task / Activity	Reference	Expected Results
1			