Course Plan for Bachelor Program - Study Plan Development and Updating Procedures/ Pharmacy Department	QF02/0408-4.0E

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	☐ 1 Synchronous: 1 Asynchronous		☐ 1 Face to Face: 1 Asynchronous		☑ 2 Traditional	

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)	**Sunday, Tuesday, Thursday ()**		**Monday, Wednesday ()**		
Division number	**Time**	**Place**	**Number of Students**	**Teaching Style**	**Approved Model**
				Traditional Learning	**2 Traditional**

Brief Description

This course is intended to introduce pharmacy students to the concept of the drugs from natural resources, by virtue of understanding their biosynthetic origin and their distribution in plants or microorganisms as sources for natural drugs and the importance of these drugs in pharmaceutical products.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	Medicinal Natural Products: A Biosynthetic Approach, Paul M. Dewick, 2009 (3rd Ed), John Wiley & Sons, ISSBN: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	☑ Class room	☐ Labs	☑ Virtual Educational Platform	☐ Others
Necessary Equipment and Software				
Supporting People with Special Needs				

For Technical Support	E-Learning & Open Educational Resources Center. Email: elearning@zuj.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 **The student should be able to:**		
K1	Define natural products, phytochemistry, primary metabolites, secondary metabolites, and building blocks.	**MK2**
K2	Describe the different secondary metabolism pathways.	**MK2**
K3	Provide examples of drugs isolated from natural source, and detect their biosynthetic pathways.	**MK2**
Skills **The student should be able to:**		
S1	Analyze complicated natural product structures and transform them into simpler fragments	**MS4**
S2	Interpret the detailed pathways that covering the biosynthesis of the secondary metabolites.	**MS4**
S3	Illustrate the natural products and their applications in therapy and pharmacy.	**MS4**
Competencies **The student should be able to:**		
C1	Develop professional and personal performance by continuously following-up lectures, submitting tasks on time, and staying up to date with the latest natural drug information.	**MC3**

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%	**20%**	50%
Asynchronous Interactive Activities	20%	20%	**0%**	0%
Final Exam	50%	50%	**50%**	50%

Note 1: *Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, and 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.*

Note 2: *According to the Regulations of granting Master's degree at Al-Zaytoonah University of Jordan, 40% of final evaluation goes for the final exam, and 60% for the semester work (examinations, reports, research or any scientific activity assigned to the student).*

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	The 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)
7-8	Shikimate pathway: Benzoic acids derivatives	Lecture	Chapter 4 (137-147)
9-10	Shikimate pathway: Phenylpropanoids derivatives **Midterm Exam**	Lecture	Chapter 4 (148-177)
11	Mevalonate pathway: Monoterpenes and sesquiterpenes	Lecture	Chapter 5 (187-222)
12	Mevalonate pathway: Diterpenes, triterpenes and tetraterpenes	Lecture	Chapter 5 (241-305)
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
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