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.	**0201361**		**Course Name**		**Pharmaceutical Analysis Lab**	
Credit Hours	**1**		**Prerequisite *Co-requisite**		**Pharmaceutical Organic Chemistry Lab + *Instrumental Analysis**	
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 Asynchronous		✓**1 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**
1		**-**	**-**	**Traditional**	**Traditional**

Brief Description

This course aim to cover different titrimetric procedures that are employed in quantitative pharmaceutical analysis and different instrumental techniques used in pharmaceutical analysis.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	• European Pharmacopeia, 7th edition • Accompanying laboratory manual.
Supportive Learning Resources (Books, databases, periodicals, software, applications, others)	1- Fundamentals of Analytical Chemistry (Brooks/Cole – Thomson Learning), 9th edition. Author: Donald West, F. James Holler, Douglas A. Skoog & Stanley R. Crouch, 2014. 2- Quantitative Chemical Analysis,7th edition (2007), (W. H. Freeman and Company). Author: Daniel C. Harris 3- Analytical Chemistry: An Introduction, 7th edition (2000), (Saunders Golden Sunburst series). Author: Douglas A. Skoog, Donald M. West, F. James Holler and Stanely R. Crouch. 4-Pharmaceutical Analysis: A Textbook for Pharmacy Students and Pharmaceutical Chemists, 3nd edition, David Watson, Elsevier/ Churchill Livingstone, 2012. 5- Spectroscopic Methods in Organic Chemistry, 6th edition, Dudley

	Williams, Ian Fleming, McGraw-Hill book company, 1995 3- Organic Structures from Spectra, 3rd edition, L. D. Field, S. Sternhell and J. R. Kalman, John Wiley & Sons, 2002. 6- M. Silverstein, Francis X. Webster and David Kiemle, John Wiley & Sons, 2005. 5- Principles of Instrumental Analysis, 6th edition, Skoog, D. A., Brooks/ Cole Thomson Learning, 2007.			
Supporting Websites	https://elearning.zuj.edu.jo/login/index.php			
The Physical Environment for Teaching	☐ Class room	✓**Labs**	☐ Virtual Educational Platform	☐ Others
Necessary Equipment and Software	Moodle.			
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	
K1	The student is expected to mention the different analytical principle & instrumental analysis techniques & procedures that are used in pharmaceutical industry.	MK2
K2	The student is expected to apply different types of volumetric, electrochemical and spectroscopic technique used in pharmaceutical analysis	MK2
K3	The student is expected to evaluate , analyze and interpret results of the different pharmaceutical methods	MK2
K4	The student is expected to employ the knowledge to design, develop and criticize pharmaceutical analysis methods	MK2
	Skills	
S1	The student is expected to achieve the basic skills essential for performing pharmaceutical analysis in pharmaceutical industry	MS4
S2	The student is expected to employ the skills to design and develop an validate different methods of pharmaceutical analysis	MS4
	Competencies	
C1	The Student is expected to manage the skills in solving problems, critical thinking , develop and validate pharmaceutical analysis procedure effectively	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)
First Exam	0	0	%20	**0**
Second / Midterm Exam	%30	%30	%20	**30%**
Participation / Practical Applications	0	0	10	**30%**
Asynchronous Interactive Activities	%30	%30	0	**0**
Final Exam	%40	%40	%50	**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.*

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

Week	Subject	Learning Style*	Reference **
1	**Check in :** **Introduction to laboratory and safety rules.**	Lecture	Lab manual content on the e-learning platform,
2	**Preparation of solutions**: - Handling of balances and - volumetric glassware (preparation of 0.1 M NaCl and 0.1 M HCl	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
3	**Direct titration:** **Part 1:** Standardization of 0.1N HCl **Part 2**: Determination of carbonate and bicarbonate in a mixture	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
4	**Back titration**: Determination of aspirin purity.	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
5	**Potentiometry:** **Part 1:** pH calibration (Demonstration) **Part 2:** Assay of acetyl salicylic acid using potentiometric titration	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
6	**Conductometry:**	Lecture	Lab manual

	Part 1: Conductimetric determination of aqueous HCL sample using aqueous solution of standardized NaOH **Part 2:** Conductimetric determination of aqueous Formic acid sample using aqueous solution of standardized NaOH **Part 3:** Conductimetric determination of a mixture of formic acid and HCl using aqueous solution of standardized NaOH	participatory learning Work within student groups. Reports, quizzes	content on the e-learning platform,
7	**Polarimetry**: Determination of unknown concentration of glucose using polarimetry	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
8	**UV-Vis Spectroscopy:** **Part 1:** Assay of paracetamol raw material using U.V. spectroscopy **Part2:** Assay of paracetamol tablets using U.V. spectroscopy **Part 3:** Solvent Effect (Demonstration)	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
9	**Molecular and atomic emission** **Part 1:** Spectrofluorometric determination of quinine bisulfate **Part 2:** Determination of potassium iodide using fluorescence quenching of quinine bisulfate **Part 3:** Assay of sodium and potassium ions in an I.V. infusion using flame photometry	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
10	**Infrared (IR) spectroscopy** **Part 1:** Using IR spectroscopy to analyze samples (Demonstration) **Part 2:** IR spectra interpretation	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
11	**Nuclear Magnetic Resonance (NMR) spectroscopy:** (^{1}H – NMR and ^{13}C - NMR) spectra interpretation	Lecture participatory learning Work within student groups. Reports, quizzes	Lab manual content on the e-learning platform,
12	**Chromatography**: Chromatographic	Lecture	Lab manual

	analysis techniques (HPLC and GC)	participatory learning Work within student groups. Reports, quizzes	content on the e-learning platform,
13	**Practical lab exam**	-	
14	**Check out**	-	-
15	**Final exams**		
16			

** 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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