

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.	0201111	Course Name	Physical Pharmacy
Credit Hours	2	Prerequisite *Co-requisite	General Chemistry for Pharmacy students
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)

Faculty Information (to be given in each semester by the subject teacher)					
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 explores the fundamental physical and chemical principles underlying pharmaceutical sciences. Topics include intermolecular forces, solution properties, reaction kinetics, chemical equilibrium, thermodynamics, and gas laws. With a focus on real-world applications, this course provides the foundational knowledge necessary for understanding and optimizing pharmaceutical systems.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	Chemistry: The Central Science. Theodore E. Brown, H. Eugene LeMay, Bruce E. Bursten, Catherine Murphy, Patrick Woodward, Matthew E. Stoltzfus. 2022, 15 th ed. Pearson.
Supportive Learning Resources (Books, databases, periodicals, software, applications, others)	1. Chemistry: The Molecular Nature of Matter, James E. Brady, Neil D. Jespersen, Alison Hyslop, 7th Edition International Student Version, 2015. 2. Chemical Principles, The Quest for Insight, Peter Atkins (Oxford University), Loretta Jones (University of Northern Colorado), Leroy Laverman (University of California, Santa Barbara), 7th Edition, 2016. 3. Chemistry, by Raymond Chang Kenneth Goldsby, 12th edition, AP student edition, 2016.
Supporting Websites	-

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The Physical Environment for Teaching	☒ Classroom	☐ 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: ellearning@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	Identify the principles of physical pharmacy including intermolecular forces, solutions, reaction rates, chemical equilibrium, chemical thermodynamics, and gas laws.	MK1
Skills		
The student should be able to:		
S1	Analyze intermolecular forces, heating curves, phase diagrams, and enthalpy changes related to temperature and phase transitions.	MS4
S2	Use colligative property principles to calculate solution concentrations, vapor pressures, boiling-point elevations, freezing-point depressions, osmotic pressures, and solute molar masses.	MS4
S3	Apply reaction kinetics by determining reaction rates, rate laws, and rate constants; applying integrated rate laws and half-life relationships; and predicting rate laws from proposed mechanisms	MS4
S4	Use equilibrium principles to manipulate expressions, calculate constants and concentrations, predict reaction direction, and use Le Châtelier's principle for changes in concentration, volume, or temperature.	MS4
S5	Evaluate thermodynamic spontaneity by calculating entropy and Gibbs free energy changes, and relating temperature, free energy, and equilibrium constants to chemical processes.	MS4
S6	Apply gas-law relationships to compute pressures, volumes, temperatures, densities, molecular weights, and total pressures of mixtures, and to interconvert between pressure units.	MS4
Competencies		
The student should be able to:		
C1	Not applicable	

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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 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	11 Liquids and Intermolecular Forces 11.1 A Molecular Comparison of Gases, Liquids, and Solids 11.2 Intermolecular Forces	Lecture, participatory learning, group work	pp. 517–524
2	11.2 Intermolecular Forces 11.3 Select Properties of Liquids 11.4 Phase Changes	Lecture, participatory learning, group work	pp. 524–535
3	11.4 Phase Changes 11.5 Vapor Pressure 11.6 Phase Diagrams 13 Properties of Solutions 13.1 The Solution Process [<i>Excluded: Energetics of Solution Formation, Solution Formation and Chemical Reactions</i>]	Lecture, participatory learning, group work	pp. 535–545, 613–617
4	13.2 Saturated Solutions and Solubility 13.3 Factors Affecting Solubility 13.4 Expressing Solution Concentration [<i>Excluded: Converting Concentration Units</i>]	Lecture, participatory learning, group work	pp. 619–630
5	13.5 Colligative Properties	Lecture, participatory learning, group work	pp. 633–643

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Week	Subject	Learning Style*	Reference **
6	14 Chemical Kinetics 14.1 Factors That Affect Reaction Rates 14.2 Reaction Rates 14.3 Concentration and Rate Laws	Lecture, participatory learning, group work	pp. 658–672
7	14.4 The Change of Concentration with Time	Lecture, participatory learning, group work	pp. 673–679
8	14.5 Temperature and Rate 14.6 Reaction Mechanisms 14.7 Catalysis	Lecture, participatory learning, group work	pp. 680–700
9	Midterm Exam 15 Chemical Equilibrium 15.1 The Concept of Equilibrium 15.2 The Equilibrium Constant	Lecture, participatory learning, group work	pp. 715–723
10	15.3 Understanding and Working with Equilibrium Constants 15.4 Calculating Equilibrium Constants 15.5 Le Châtelier's Principle	Lecture, participatory learning, group work	pp. 724–746
11	19 Chemical Thermodynamics 19.1 Spontaneous Processes 19.2 Entropy and the Second Law of Thermodynamics 19.3 The Molecular Interpretation of Entropy and the Third Law of Thermodynamics 19.4 Entropy Changes in Chemical Reactions	Lecture, participatory learning, group work	pp. 904–925
12	19.5 Gibbs Free Energy 19.6 Free Energy and Temperature 19.7 Free Energy and the Equilibrium Constant	Lecture, participatory learning, group work	pp. 926–938
13	10 Gases 10.2 Pressure 10.3 The Gas Laws 10.4 The Ideal-Gas Equation	Lecture, participatory learning, group work	pp. 474–489
14	10.4 The Ideal-Gas Equation 10.5 Gas Mixtures and Partial Pressures	Lecture, participatory learning, group work	pp. 489–493
15, 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)

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Week	Task / Activity	Reference	Expected Results
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