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| **1** | **Course title** | **Physical Pharmacy** |
| **2** | **Course number** | **1202235** |
| **3** | **Credit hours** | **2 (theory)** |
| **Contact hours (theory, practical)** | **2 (theory)** |
| **4** | **Prerequisites/corequisites** | **Physicochemical Principles of Pharmacy** |
| **5** | **Program title** | **Pharmacy and Pharm D** |
| **6** | **Program code** |  |
| **7** | **Awarding institution**  | **The University of Jordan** |
| **8** | **School** | **Pharmacy** |
| **9** | **Department** | **Pharmaceutics and Pharmaceutical Technology** |
| **10** | **Level of course**  | **undergraduate** |
| **11** | **Year of study and semester (s)** | **First Semester, 2020-2021** |
| **12** | **Final Qualification** | **Pharmacy and Pharm D** |
| **13** | **Other department (s) involved in teaching the course** |  |
| **14** | **Language of Instruction** | **English** |
| **15** | **Teaching methodology** | [ ] Blended [x] Online |
| **16** | **Electronic platform(s)** | [x] Moodle [x] Microsoft Teams [ ] Skype [ ] Zoom [ ] Others………… |
| **17** | **Date of production/revision** |  |

**18 Course Coordinator:**

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| Dr. Sharif Abdelghany Department of Pharmaceutics and Pharmaceutical Technology Faculty of Pharmacy The University of Jordan Amman-Jordan 11942E-mail:  s.abdelghany@ju.edu.joOffice Location: Second floor; office #225 |

**19 Other instructors:**

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| Prof. Enam KhalilDepartment of Pharmaceutics and Pharmaceutical Technology Faculty of Pharmacy The University of Jordan Amman-Jordan 11942E-mail: ekayoub@ju.edu.joOffice Location: Second floor; office #230 |

**20 Course Description:**

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| As stated in the approved study plan.Explore critical concepts and phenomena in Physical Chemistry with relevance to pharmaceutical systems such as: partitioning, complexation, reaction kinetics/drug stability, diffusion, dissolution and interfacial phenomena. Moreover, you will be introduced to the applications/implications of each phenomenon in pharmaceutical systems. This course provides you with the fundamental knowledge that is required to understand/solve relevant systems/problems that might be encountered in future practice. |

**21 Course aims and outcomes:**

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| 1. **A- Aims:**

This course aims to:1. Provide students with knowledge on the following physical phenomenal from a pharmaceutical perspective: partitioning, complexation, reaction kinetics/drug stability, diffusion, dissolution and interfacial phenomena.
2. Strengthen student’s ability to apply the gained knowledge (in aim 1) in further pharmaceutical applications such as: drug design, dosage form development, biopharmaceutical prediction and drug stability evaluation.
3. **Intended Learning Outcomes (ILOs):**

Upon successful completion of this course, students will be able to:1. Explain the basis of distribution phenomena and its relevance to pharmaceutical systems such as drug partitioning, extraction and preservative action in pharmaceutical emulsions.
2. Solve distribution-related calculations such determination of drug partitioning coefficient, extraction efficiency and required amount of preservative in pharmaceutical emulsions.
3. Understanding complexation phenomena (classes/types, forces involved in forming complexes, methods of analysis, consequences on drug bioavailability and plasma protein binding).
4. Determine complexation parameters (stoichiometric ratio and stability constant).
5. Describe chemical reaction rate/order and related mathematical formulae.
6. Understand the concept of accelerated stability testing and fundamentals.
7. Calculate the rate constant for reactions, half-life and shelf life of pharmaceutical products.
8. Understand the diffusion and dissolution processes and describe related examples in the pharmaceutical science and practice.
9. Calculate diffusion/dissolution-related pharmaceutical parameters such as diffusion coefficient, membrane permeability, and drug release rate from pharmaceutical dosage forms.
10. Understand the basis of the interfacial phenomenon and its importance in pharmaceutical systems.
11. Discuss the behavior of surface active agents in liquid phase including micellization phenomena and its pharmaceutical applications.
12. Explain the adsorption phenomena and adsorption isotherms and its relevance to pharmaceutical applications/systems.

Correlate the structural/physiochemical properties of drug with covered phenomena throughout the course. |

**22. Topic Outline and Schedule:**

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| **Topic** | **Week(s)** | **Teaching Method** | **Achieved ILOs** | **Evaluation Methods** |  **Reference** |
| **Partitioning and distribution phenomena:**1. Introduction and pharmaceutical relevance
2. Effect of ionic dissociation on partitioning
3. Preservative action in oil/water system
4. Extraction
 | 1+2 | MS teams, Youtube | 1,2,13 | As per Section 22 (A,B,C) | As per Section 25 (A,B) |
| **Complexation phenomena and protein binding:**1. Introduction and pharmaceutical relevance
2. Types of complexes (metal, organic, inclusion/occlusion)
3. Method of complexation analysis (distribution and solubility methods)
4. Method of protein binding analysis (equilibrium dialysis and ultrafiltration methods).
 | 3+4+5 | MS teams, Youtube | 3,4,13 | As per Section 22 (A,B,C) | As per Section 25 (A,B) |
| **Reaction kinetics and pharmaceutical stability:**1. Introduction and pharmaceutical Relevance
2. Rates and orders of reactions
3. Determination of reaction order (half-life method)
4. Influence of temperature on reaction rate
5. Collision theory
6. Transition state theory
7. Catalysis
8. Acid – Base Catalysis
 | 6+7+8 | MS teams, Youtube | 5-7,13 | As per Section 22 (A,B,C) | As per Section 25 (A,B) |
| **Diffusion phenomena:**1. Definition, mechanism, related phenomena and processes
2. Fick’s First Law of diffusion
3. Fick’s Second Law of diffusion
4. Steady state diffusion
 | 9 | MS teams, Youtube | 8,9,13 | As per Section 22 (A,B,C) | As per Section 25 (A,B) |
| **Dissolution phenomena:**1. Introduction and pharmaceutical Relevance
2. Drug Release from dosage forms
3. Percutaneous absorption of drugs
 | 10 | MS teams, Youtube | 8,9,13 | As per Section 22 (A,B,C) | As per Section 25 (A,B) |
| **Interfacial Phenomena:**1. Introduction and pharmaceutical Relevance
2. Adsorption at liquid interfaces
3. HLB classification
4. Adsorption at solid interfaces
5. Langmuir isotherm
6. Freundlich isotherm
7. BET isotherm
8. Solid-Liquid interfaces
 | 11+12 | MS teams, Youtube | 10-13 | As per Section 22 (A,B,C) | As per Section 25 (A,B) |

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* Evaluation methods include: Assignment, Quiz and Exams.

**23 Evaluation Methods:**

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| Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

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| **Evaluation Activity** | **Mark** | **Topic(s)** | **Period (Week)** | **Platform** |
| Quiz  | 10 | Topics 1  | Four |   Moodle |
| Midterm Exam | 30 | Topics 1, 2 |  | - |
| Assignment  | 10 | Select at a topic in Physical Pharmacy | Seventh |   Moodle |
| Final Exam | 50 | All topics |  | - |
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**24 Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):**

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1. **Course Policies:**

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**26 References:**

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| 1. Required book(s), assigned reading and audio-visuals:
2. Pharmaceutical Practice, A.J. Winfield, J.A. Rees and I.Smith. 4th edition, 2009. Published by Churchill Livingstone.

2. Pharmaceutical Practice, A.J. Winfield and R.M.E. Richards. 3rd edition, 2004. Published by Churchill Livingstone.1. Pharmaceutics: the science of dosage form design, Aulton M.E. 2nd edition, 2002. Published by Churchill Livingstone.

B- Recommended books, materials and media: |

**27 Additional information:**

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Name of Course Coordinator: Dr. Sharif Abdelghany. Signature: ------------------ Date: October 12th, 2020

Head of Curriculum Committee/Department: ---------------------------- Signature: --------------------------

Head of Department: ------------------------------------------------------------ Signature: -----------------------

Head of Curriculum Committee/Faculty: ---------------------------------------- Signature: -------------------

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