**Course Description**

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| **Faculty** | **Pharmacy** | | | | | | |
| **Department** | **Pharmaceutics and pharmaceutical Technologies** | | | **Level** | | |  |
| **Course** | **Physical Pharmacy** | **Code** | **1701205** | **Prerequisite** | | |  |
| **Credit hours** | 3 | **Theoretical** |  | **Practical** | | |  |
| **Coordinator** | Rehan Al kasasbeh | **Email** |  | | | | |
| **Teachers** | Rawan Alkaraki | **Emails** |  | | | | |
| **Lecture Time** |  | **Place** |  | | **Attendance mode** |  | |
| **Semester** |  | **Preparation date** |  | | **Modification Date** |  | |

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| **Abstracted Course Description** |
| Study of the physicochemical properties of molecules incorporated in pharmaceutical preparations. More specifically, this course deals with studying the order of chemical reactions, drug stability and decomposition, Complexation and protein binding, diffusion and dissolution, and surfactant and surface phenomena. Moreover, selected applications of each phenomenon in pharmaceutical systems will be covered. |
| **Course Goals** |
| * To equip students with a solid understanding of the physical principles underpinning pharmaceutical science and practice. * To develop problem-solving skills in addressing challenges related to drug formulation, stability, and dosage form design. * To prepare students for advanced studies and research in pharmaceutical sciences. * To enable students to make informed decisions in pharmaceutical product development. * To foster effective communication of physical pharmacy concepts. |

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| **CILOs** |
| **Knowledge** |
| a1. Demonstrate comprehensive knowledge of the physical principles and theories applicable to pharmaceutical science.  a2. Explain the fundamental principles of thermodynamics and chemical kinetics in the context of pharmaceuticals.  a3. Describe the physicochemical characteristics of drugs and their implications for pharmaceutical formulations. |
| **Skills** |
| b1. Apply physical principles to evaluate drug stability, solubility, and compatibility in pharmaceutical formulations.  b2. Analyze and solve complex problems related to drug formulation and dosage form design.  b3. Utilize quantitative techniques to assess and optimize pharmaceutical products. |
| **Competencies** |
| c1. Communicate effectively and professionally about physical pharmacy concepts and their practical applications.  c2. Exhibit critical thinking skills in evaluating and making decisions related to drug development and pharmaceutical product design.  c3. Demonstrate the ability to work collaboratively in multidisciplinary pharmaceutical teams. |
| **Learning Methods** |
| * Lectures and class discussions * Laboratory experiments and practical applications * Research and independent study |
| **Evaluation Tools** |
| Quizzes, Midterm exam, Final Exam |

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| **Week** | **Topics** | **Learning methods** | **Evaluation tool** | **ILOs** | **Hours** |
| **1.** | **Introduction to Physical Pharmacy** | Lectures | Practical exercises | A1,2b3 | **3** |
| **2.** | **Partitioning and distribution phenomena:**   1. Introduction and pharmaceutical relevance 2. Effect of ionic dissociation on partitioning | Lectures | Case studies | A3,1 | **3** |
| **3.** | 3. Preservative action in oil/water system  4. Extraction | Lectures | Lectures | A2 | **3** |
| **4.** | **Complexation phenomena and protein binding:**   1. Introduction and pharmaceutical relevance 2. Types of complexes (metal, organic, inclusion/occlusion) | Lectures |  | A1 | **3** |
| **5.** | 3. Method of complexation analysis (distribution and solubility methods)  4. Method of protein binding analysis (equilibrium dialysis and ultrafiltration methods). | Lectures |  | B1,3 | **3** |
| **6.** | **Reaction kinetics and pharmaceutical stability:**   1. Introduction and pharmaceutical Relevance 2. Rates and orders of reactions | Case studies | Exam | C1,2 | **3** |
| **7.** | 3. Determination of reaction order (half-life method)  4. Influence of temperature on reaction rate  5. Collision theory | Case studies | Exam | C1,2b3 | **3** |
| **8.** | 6. Transition state theory  7. Catalysis  8. Acid – Base Catalysis | Case studies |  | A1,4,3 | **3** |
| **9.** | Midterm Exam | Guest lectures | Exam | A1,2 | **3** |
| **10.** | **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 | Lectures |  | B3,2 | **3** |
| **11.** | **Dissolution phenomena:**   1. Introduction and pharmaceutical Relevance 2. Drug Release from dosage forms 3. Percutaneous absorption of drugs | Lectures | Homework | C2,3 | **3** |
| **12.** | **Interfacial Phenomena:**   1. Introduction and pharmaceutical Relevance 2. Adsorption at liquid interfaces 3. HLB classification 4. Adsorption at solid interfaces | Case studies |  | A3b2 | **3** |
| **13.** | 5. Langmuir isotherm  6. Freundlich isotherm  7. BET isotherm | Guest lectures | Exam | A2,b3 | **3** |
| **14.** | 8. Solid-Liquid interfaces |  | Exam | B3,2 | **3** |
| **15.** | Final Exam |  |  |  | **2** |

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| **Plan of Course Evaluation** | | | | | | | | | | | |
| **Evaluation Tools** | | **Mark** | **ILOs** | | | | | | | | |
| **A1** | **A2** | **A3** | **B1** | **B2** | **B3** | **C1** | **C2** | **C3** |
| **First Exam (Mid-term)** | | **30%** | \* | \* |  | \* |  |  |  |  | \* |
| **Second Exam (If available)** | |  |  |  |  |  |  |  |  |  |  |
| **Final Exam** | | **50%** |  |  | \* |  |  |  | \* | \* |  |
| **Activities** | | **20%** |  | | | | | | | | |
| **Activities Evaluation** | Homework/Tasks | 10% |  |  |  | \* | \* |  | \* |  |  |
| Case Study |  |  |  |  |  |  |  |  |  |  |
| Discussion and Interactions |  |  |  |  |  |  |  |  |  |  |
| Group Activities |  |  |  |  |  |  |  |  |  |  |
| Laboratory Exams |  |  |  |  |  |  |  |  |  |  |
| Presentations |  |  |  |  |  |  |  |  |  |  |
| Quizzes | 10% |  | \* | \* |  |  | \* |  |  | \* |
| Others |  |  |  |  |  |  |  |  |  |  |
| **Total** | | 100% |  | \* |  | \* |  |  |  |  |  |

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| **Components** | |
| **Book** |  |
| **References** |  |
| **Recommended Readings** |  |
| **Electronic materials** |  |
| **Other websites** |  |