



**Syllabus: Physical Pharmacy 2 (131701333)**  
**Second Semester 20.. /20..**

COURSE INFORMATION	
<b>Course Name:</b> Physical Pharmacy 2 (face-to-face education) <b>Semester:</b> Second <b>Department:</b> Department of Department of Pharmaceutics and Pharmaceutical Technology <b>Faculty:</b> Pharmaceutical Sciences	<b>Course Code:</b> 131701333 <b>Section:</b> <b>Core Curriculum:</b> Compulsory
<b>Day(s) and Time(s):</b> : According to HU courses timetable/semester <b>Classroom:</b> According to HU courses timetable/semester	<b>Credit Hours:</b> 2 <b>Prerequisites:</b> Physical Pharmacy 1 (131701317)
COURSE DESCRIPTION	
<p>This course addresses the basic physicochemical principles that determine the behavior of pharmaceutical materials in different physical and biological systems related to drug formulation and delivery. Diffusion, drug release and dissolution, chemical kinetics and stability, colloidal and coarse dispersions, interfacial phenomena, rheology, and complexation are thoroughly discussed.</p>	
DELIVERY METHODS	
<p>The course will be delivered through a combination of active learning strategies. These will include:</p> <ul style="list-style-type: none"> <li>• PowerPoint lectures and active classroom-based discussion</li> <li>• Collaborative learning through small groups acting in an interdisciplinary context.</li> <li>• E-learning resources: e-reading assignments and practice quizzes through Model and Microsoft Team</li> </ul>	

## FACULTY INFORMATION

<b>Name</b>	<b>Dr.Areen Sulaiman Alshweiat</b>
<b>Academic Title:</b>	<b>Assistant Professor</b>
<b>Office Location:</b>	<b>A429</b>
<b>Telephone Number:</b>	<b>3429</b>
<b>Email Address:</b>	<b>Areen.alshweiat@hu.edu.jo</b>
<b>Office Hours:</b>	As announced per semester <i>Please send an e-mail ( Areen.alshweiat@hu.edu.jo) to meet at any other time.</i>

## REFERENCES AND LEARNING RESOURCES

### Required Textbook

1. Sinko, P.J. Martin's Physical Pharmacy, 6 th edition, Lippincott Williams & Wilkins, 2011

### Suggested Additional Resources:

1. Florence A.T. and Attwood. D. Physicochemical Principles of Pharmacy, 5th Edition. 2011. Published by Pharmaceutical Press, UK
2. Ma, J. K., & Hadzija, B. (2013). Basic physical pharmacy. Jones & Bartlett Publishers.
3. Amiji, M.M., Cook, T.J., and Mobley, W.C. Applied Physical Pharmacy, 2nd edition, McGraw Hill Education, 2014
4. Dash, A.K., Singh, S. and Tolman, J. Pharmaceutics: Basic Principles and Application to Pharmacy Practice. Elsevier Academic Press, 2014

## COURSE OBJECTIVES

### **After successful completion of this course student is expected to:**

1. Understand and explain the physicochemical principles related to pharmaceutical systems
2. Understand the effects of the physicochemical principles on the properties of systems
3. Integrate and apply knowledge of the physicochemical principles in the development of pharmaceutical dosage forms
4. Identify, analyze, interpret, integrate and evaluate formulation and manufacturing problems related problems.
5. Determine the best storage conditions for the different dosage forms
6. Calculate the shelf life of different dosage forms
7. Develop an appropriate plan to manage and overcome inconveniences of pharmaceutical formulations and dosage forms

## INTENDED LEARNING OUTCOMES

### **A. Knowledge and understanding**

To understand the interfacial phenomena and rheological behavior of pharmaceutical systems.

**A2:** To understand the rationale and theory related to discussed topics and recognize their pharmaceutical application

- A3:** To understand the properties of pharmaceutical systems such as dispersed systems
- A4:** To develop knowledge about diffusion and drug release from different pharmaceutical systems
- A5:** To understand and explain the different mechanisms of drug breakdown and kinetics of degradation
- A6:** To understand and explain the different properties of pharmaceutical polymers
- A7:** To develop knowledge about complexations and protein binding

#### **B. Intellectual skills**

- B1:** To Apply information regarding discussed physical principles in designing dosage forms
- B2:** To develop the ability to employ the principles in solving related formulation and manufacturing problems.
- B2:** To Solve problems related to diffusion, drug release, dissolution, chemical kinetics, and HLB

#### **C. Approach to practice pharmacy**

- C1:** To implement the concepts in formulation, package, and storage of different dosage forms
- C2:** To deliver the patient with the best storage conditions for different dosage forms
- C2:** To calculate the shelf life of different dosage forms

#### **D. Personal and professional development**

- D1:** To develop critical thinking, problem solving and decision making abilities
- D2:** To develop the ability to utilize IT skills in gaining and presenting information
- D3:** To develop skills of team work and time management

### **STUDENT LEARNING OUTCOMES MATRIX\***

Alignment matrix between the course objectives and the **course** learning outcomes (CLOs) with the **program** learning outcomes (PLOs).

Core curriculum learning outcomes	B.Sc. Pharmacy Program ILOs	Course Objectives	Course Student ILOs				Assessment Method
			A	B	C	D	
Foundational Knowledge	Learner	1-5	A.1 A.2 A.3 A.4 A.5 A.6 A.7				<ul style="list-style-type: none"> <li>Exams</li> <li>Quizzes</li> <li>Homework</li> <li>Discussion</li> </ul>
Essentials for Practice and Care	Caregiver Manager Provider	4-7		B.1 B.2 B.3	C.1 C.2 C.3		<ul style="list-style-type: none"> <li>Exams</li> <li>Quizzes</li> <li>Homework</li> <li>Discussion</li> </ul>

Approach to Practice and Care	Creative Thinker & Problem-Solver  Educator	4-7		B.1 B.2 B3	C.1 C.2 C.3		<ul style="list-style-type: none"> <li>• Exams</li> <li>• Quizzes</li> <li>• Homework</li> <li>• Discussion</li> </ul>
Personal & Professional Development	Self-aware  Leader  Professional	4-7		B.1 B.2 B3	C.1 C.2 C.3	D.1 D.2 D.3	<ul style="list-style-type: none"> <li>• Exams</li> <li>• Quizzes</li> <li>• Homework</li> <li>• Discussion</li> </ul>

## ACADEMIC SUPPORT

It is The Hashemite University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their Instructor to ensure that their individual needs are met.

### **Special Needs Section:**

**Tel:** 00962-5-3903333

**Extension:** 4209

**Location:** Students Affairs Deanship/ Department of Student Welfare Services

**Email:** [amalomoush@hu.edu.jo](mailto:amalomoush@hu.edu.jo)

[amalomoush@staff.hu.edu.jo](mailto:amalomoush@staff.hu.edu.jo)

## COURSE REGULATIONS

### ***Participation***

Class participation and attendance are important elements of every student's learning experience at The Hashemite University, and the student is expected to attend all classes. A student should not miss more than 15% of the classes during a semester. *Those exceeding this limit of 15% will receive a failing grade regardless of their performance.* It is a student's responsibility to monitor the frequency of their own absences. **Attendance record begins on the first day of class irrespective of the period allotted to drop/add and late registration. It is a student's responsibility to sign-in; failure to do so will result in a non-attendance being recorded.**

In exceptional cases, the student, with the instructor's prior permission, could be exempted from attending a class provided that the number of such occasions does not exceed the limit allowed by the University. The instructor will determine the acceptability of an absence for being absent. A student who misses more than 25% of classes and has a valid excuse for being absent will be allowed to withdraw from the course.

On average, students need to spend 15 hrs of study and preparation weekly. At the beginning of the lectures, be on time and don't leave before the end of the lecture without an accepted excuse.

If you missed a class, it is your responsibility to find out about any announcements or assignments you have missed. For any clarification, please communicate your instructor at her posted office hours or by appointment. Listen well to the lecture, if you have a question, ask your instructor. You will find the course material at the course team after the lecture.

### ***Plagiarism***

Plagiarism is considered a serious academic offence and can result in your work losing marks or being failed. HU expects its students to adopt and abide by the highest standards of conduct in their interaction with their professors, peers, and the wider University community. As such, a student is expected not to engage in behaviours that compromise his/her own integrity as well as that of the Hashemite University.

Plagiarism includes the following examples and it applies to all student assignments or submitted work:

- **Use of the work, ideas, images or words of someone else without his/her permission or reference to them.**
- **Use of someone else's wording, name, phrase, sentence, paragraph or essay without using quotation marks.**
- **Misrepresentation of the sources that were used.**

**The instructor has the right to fail the coursework or deduct marks where plagiarism is detected**

### ***Late or Missed Assignments***

In all cases of assessment, students who fail to attend an exam, class project, or deliver a presentation on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a fail grade for this part of the assessment.

- Submitting a term paper on time is a key part of the assessment process. Students who fail to submit their work by the deadline specified will automatically receive a 10% penalty. Assignments handed in more than 24 hours late will receive a further 10% penalty. Each subsequent 24 hours will result in a further 10% penalty.
- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with University regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

### ***Student Complaints Policy***

Students at The Hashemite University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

## **COURSE ASSESSMENT**

## ***Course Calendar and Assessment***

Students will be graded through the following means of assessment and their final grade will be calculated from the forms of assessment as listed below with their grade weighting taken into account. The criteria for grading are listed at the end of the syllabus

<b>Assessment</b>	<b>Grade Weighting</b>	<b>Deadline Assessment</b>
First exam	25%	TBA
Second exam	25%	TBA
Quizzes-Homework	10%	TBA
Final exam	40%	TBA

### **Description of Exams**

Test questions will predominately come from the material presented in the lectures. Semester exams will be conducted during the regularly scheduled lecture period. The exam will consist of a combination multiple-choice, short answer, match, true and false, calculation problems, and/or descriptive questions.

**Homework:** Will be given for the selected chapters, while the chapter in progress you are supposed to work on them continuously and submit in the announced date.

You are also expected to work on in-chapter examples, self-tests and representative number of end of chapter problems. The answers of self-tests and end of chapter exercises are given at the end of the book.

**Quizzes:** Announced quizzes will be given during or/and at the end of each chapter based upon the previous lectures.

No make-up exams, homework or quizzes will be given. Only documented absences will be considered as per HU guidelines.

Grades are not negotiable and are awarded according to the following criteria\*:

<b>Letter Grade</b>	<b>Description</b>	<b>Grade Points</b>
A+	Excellent	4.00
A		3.75
A-		3.50
B+	Very Good	3.25
B		3.00
B-		2.75
C+	Good	2.50

C		2.25
C-		2.00
D+	Pass	1.75
D	Pass	1.50
F	Fail	0.00
I	Incomplete	-

## WEEKLY LECTURE SCHEDULE AND CONTENT DISTRIBUTION

Note: For Physical Pharmacy 2 sections with 2 lecture periods per week (S/T or M/W ), one lecture period covers 1.5 lecture hours (80 minutes). The course content specifies the sections in chapters of the reference textbooks will be included in quizzes, homework and exams.

<b><u>Chapter 15</u></b>	<b><u>Interfacial phenomena</u></b>	<b><u>Week 1-2</u></b>	<b><u>4 lecture hours</u></b>
Surface and Interfacial Tensions			
Surface free energy			
Surface Active Agents			
Micellization			
HLB system			
Applications of surface active agents			
Measurement of Tensions			
<b><u>Chapter 19</u></b>	<b><u>Rheology</u></b>	<b><u>Week 3-4</u></b>	<b><u>4 lecture hours</u></b>
Pharmaceutical importance			
Types of flow			
Newtonian Systems			
Newton's Law of Flow			
Non-Newtonian Systems			
Thixotropy			
Anti-thixotropy			
Determination of Rheological Properties			
<b><u>Chapter 11</u></b>	<b><u>Diffusion</u></b>	<b><u>Week 5-6</u></b>	<b><u>3 lecture hours</u></b>
Pharmaceutical importance			
Fick's First Law of Diffusion			
Fick's Second Law of Diffusion			
Steady-state Diffusion			
Procedures and Apparatus For Assessing Drug Diffusion			
Diffusion driving forces			
Pharmaceutical importance			
<b><u>Chapter 13</u></b>	<b><u>Drug release and dissolution</u></b>	<b><u>Week 6-8</u></b>	<b><u>5 lecture hours</u></b>
Introduction			
Noyes and Whitney equation			
Hixson-Crowell Cube-Root Law			
Factors affecting dissolution			
Intrinsic dissolution rate			
Drug release from matrix			
The Higuchi model			
Biopharmaceutical classification system (BCS)			
Dissolution methods and Apparatus			

Biorelevant media			
<u>Chapter 17+19</u>	<u>Dispersed system</u>	<u>Week 9-11</u>	<u>6 lecture hours</u>
Classification			
Colloidal dispersions			
Properties of colloids			
Colloid stability			
Coarse dispersions			
Emulsions			
Suspensions			
<u>Chapter 7</u>	<u>Pharmaceutical polymers</u>	<u>Week 12</u>	<u>2 lecture hours</u>
Definitions			
Polymer properties			
General properties of polymer solution			
Interaction of polymers with solvents			
Water-soluble polymers			
Water-insoluble polymers			
Pharmaceutical applications of polymers			
<u>Chapter 14</u>	<u>Chemical kinetics and stability</u>	<u>Week 13-15</u>	<u>4 lecture hours</u>
Introduction			
Chemical decomposition of drugs			
Rates and orders of reactions			
Half-life and shelf life			
Determination of reaction order			
Complex reactions			
Factors influencing drug stability			
Stability testing			
<u>Chapter 10</u>	<u>Complexation and protein binding</u>	<u>Week 16</u>	<u>3 lecture hours</u>
Metal ion complexes			
Inclusion complexes			
Methods of analysis of complexes			
Protein binding			
University Exams		<u>Week 16</u>	