



**Syllabus: Physical Pharmacy 1 (131701317)**  
**First Semester 2021 /2022**

COURSE INFORMATION	
<p><b>Course Name:</b> Physical Pharmacy 1 (<b>face-to-face education</b>)  <b>Semester:</b> First  <b>Department:</b> Department of Department of Pharmaceutics and Pharmaceutical Technology  <b>Faculty:</b> Pharmaceutical Sciences</p>	<p><b>Course Code:</b> 131701317  <b>Section:</b>  <b>Core Curriculum:</b> Compulsory</p>
<p><b>Day(s) and Time(s) :</b>                      Sun, Mon, Tues: TBA                      Mon, Wed: TBA  <b>Classroom:</b> TBA</p>	<p><b>Credit Hours:</b> 2  <b>Prerequisites:</b> Pharmaceutical Calculations and Compounding (131701231)</p>
COURSE DESCRIPTION	
<p>This course investigates the application of physicochemical principles on problems in the pharmaceutical sciences. The impacts of physicochemical and biopharmaceutical properties of drugs on the safety, effectiveness, stability, and formulation of various pharmaceutical dosage forms are discussed thoroughly during the course. Topics of states of matter, phase equilibria, thermodynamics, solutions, ionic equilibria and buffering, solubility, and partitioning are investigated.</p>	
DELIVERY METHODS	
<p>The course will be delivered through a combination 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>Areen Sulaiman Alshweiat</b>

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<b>Office Hours:</b>	<b>TBA</b> <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, TJ., 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

## STUDENT LEARNING OUTCOMES MATRIX\*

Core Curriculum Learning Outcomes	Program Learning Outcomes	Course Objectives	Course Student Learning Outcomes	Assessment Method
<b>CLO-1</b> Think critically and creatively in a variety of methods in order to make decisions and solve problems.	1: Apply critical thinking and demonstrate problem-solving skills in two or more of the major fields of physical pharmacy.	1. Develop an understanding of the principles of physical pharmacy.	1.1. Understand the basics of the physicochemical properties of drugs such as: Intermolecular forces, States of matter (gas, liquid and solid) and phase equilibria and phase rule. 1.2. Understand the rationale and theory related to discussed topics and recognize their pharmaceutical application.	<ul style="list-style-type: none"> <li>• Exams</li> <li>• Quizzes</li> <li>• Homework assignments</li> </ul>
		2. Provide the theoretical knowledge and understanding of the physicochemical principles related to pharmaceutical systems	2.1. Understand basic rules, laws and equations regarding the discussed topic such as equations of thermodynamics, phase rule, ideal gas equation, Clausius –Clapyron equation equations describing colligative properties (Raoult's law, Vant Hoff equation), Buffer equation.	<ul style="list-style-type: none"> <li>• Exams</li> <li>• Quizzes</li> </ul>
		3. Learn to solve problems.	3.1. Solve problems related to states of matter, concentration expression, buffers and isotonic solutions.	<ul style="list-style-type: none"> <li>• Exams</li> <li>• Quizzes</li> <li>• Homework assignments</li> </ul>
		4. Develop the ability to employ the principles in the development of pharmaceutical dosage forms and solving related formulation and manufacturing problems.	4.1. Analyze, present and compare the data obtained from some preformulation tests, such as x-ray powder diffraction, differential scanning calorimetry, thermogravimetry.  4.2. Recognize the application of concepts in formulation, package and storage of different dosage forms.	<ul style="list-style-type: none"> <li>• Exams</li> <li>• Quizzes</li> <li>• Homework assignments</li> </ul>
<b>CLO-2</b> Demonstrate competency in the use of research skills and various information sources.	1: Use modern literature search methods to obtain information about physical pharmacy topics and write reports.	1. Obtain an understanding of the role of physical pharmacy in pharmaceutical application.	1.1. Acquire the ability to learn independently; articulate the importance of independent learning for future professional development	<ul style="list-style-type: none"> <li>• “On-line” reading assignments</li> <li>• Term project</li> </ul>
<b>CLO-3</b> Communicate competently with others using oral and	1: To develop critical thinking, problem solving and decision making abilities	1. Acquire positive attitudes towards further studies in the topics of physical pharmacy1.	1.1. Develop a positive attitude towards the topics of physical pharmacy1.	<ul style="list-style-type: none"> <li>• Term project</li> </ul>

written English skills.				
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## 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>
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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\*:

Letter Grade	Description	Grade Points
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	-

Note: For Physical Pharmacy 1 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.

<u>Chapter 2</u>	<u>State of Matter</u>	<u>Week 1-3</u>	<u>6 lecture hours</u>
Binding forces between molecules			
The gaseous state			
The liquid state			
<u>Chapter 2</u>	<u>Phase equilibria and phase rule</u>	<u>Week 4</u>	<u>2 lecture hours</u>
Systems containing one component			
Two-component systems containing liquid phases			
Two-component systems containing solid and liquid phases: Eutectic mixtures			
Three-component systems			
<u>Chapter 3</u>	<u>Thermodynamics</u>	<u>Week 5-6</u>	<u>3 lecture hours</u>
Thermodynamic system Energy			
Thermodynamic processes			
Thermodynamic states			
The first law of thermodynamics			
The second law of thermodynamics			
The third law of thermodynamics			
Free energy			
<u>Chapter 4</u>	<u>Determination of the physical properties of solutions</u>	<u>Week 6-7</u>	<u>3 lecture hours</u>
Additive and constitutive properties			
Dielectric constant and induced polarization			
Permanent dipole moment of polar molecules			
Electromagnetic radiation			
Atomic and molecular spectra			
Ultraviolet and visible spectrophotometry			
Fluorescence and phosphorescence			
Infrared spectroscopy			
Near infrared spectroscopy			
Electron paramagnetic and nuclear magnetic resonance spectroscopy			
Refractive index and molar refraction			
Optical rotation			
<u>Chapter 5</u>	<u>Solutions</u>	<u>Week 8-9</u>	<u>4 lecture hours</u>
Types of solutions			
Concentration expressions			
Ideal and real solutions			
Raoult's Law			
Colligative properties of solutions Electrolyte dissociation			
<u>Chapter 7</u>	<u>Acid-base equilibria</u>	<u>Week 10-11</u>	<u>4 lecture hours</u>
Arrhenius Theory, Brønsted–Lowry Theory, Lewis Electronic Theory			
Ionization of Weak Electrolytes			
Ionization of salts			
Ionization of Polyprotic Electrolytes			
Ionization of Water			
pH			

<b>Calculation of pH</b>			
<b><u>Chapter 8</u></b>	<b><u>Buffered and isotonic solutions</u></b>	<b><u>Week 12-13</u></b>	<b><u>3 lecture hours</u></b>
<b>Buffer Equation</b>			
<b>Buffer Capacity</b>			
<b>Pharmaceutical Buffers</b>			
<b>Isotonic Solutions</b>			
<b>Measurement of Tonicity</b>			
<b>Methods of Adjusting Tonicity</b>			
<b><u>Chapter 9</u></b>	<b><u>Solubility and distribution phenomena</u></b>	<b><u>Week 13-14</u></b>	<b><u>3 lecture hours</u></b>
<b>Expressions of solubility</b>			
<b>Solute-Solvent interactions</b>			
<b>Factors influencing solubility</b>			
<b>Solubility of gases in liquids</b>			
<b>Solubility of liquids in liquids</b>			
<b>Solubility of solids in liquids</b>			
<b>Partition coefficient</b>			
<b>Apparent partition coefficient</b>			
<b><u>Review</u></b>		<b><u>Week 15</u></b>	
<b>University Exams</b>		<b><u>Week 16</u></b>	



## ASSESSMENT RUBRICS

Classroom Participation: Assessment Criteria					S c o r e
Criteria	Quality				
	Excellent (4 points)	Good (3 points)	Satisfactory (2 points)	Needs Improvement (1 points)	
Degree to which student integrates course readings into classroom participation	<ul style="list-style-type: none"> <li>- often cites from readings;</li> <li>- uses readings to support points;</li> <li>- often articulates "fit" of readings with topic at hand.</li> </ul>	<ul style="list-style-type: none"> <li>-occasionally cites from readings;</li> <li>- sometimes uses readings to support points;</li> <li>-occasionally articulates "fit" of readings with topic at hand .</li> </ul>	<ul style="list-style-type: none"> <li>-rarely able to cite from readings;</li> <li>- rarely uses readings to support points;</li> <li>- rarely articulates "fit" of readings with topic at hand</li> </ul>	<ul style="list-style-type: none"> <li>-unable to cite from readings;</li> <li>-cannot use readings to support points; cannot articulate "fit" of readings with topic at hand .</li> </ul>	
Interaction / participation in classroom discussions	<ul style="list-style-type: none"> <li>-always a willing participant, responds frequently to questions;</li> <li>- routinely volunteers point of view .</li> </ul>	<ul style="list-style-type: none"> <li>-often a willing participant,</li> <li>- responds occasionally to questions;</li> <li>- occasionally volunteers point of view .</li> </ul>	<ul style="list-style-type: none"> <li>-rarely a willing participant,</li> <li>- rarely able to respond to questions;</li> <li>- rarely volunteers point of view .</li> </ul>	<ul style="list-style-type: none"> <li>-never a willing participant.,</li> <li>- never able to respond to questions;</li> <li>- never volunteers point of view .</li> </ul>	
Interaction /participation in classroom learning activities	<ul style="list-style-type: none"> <li>-always a willing participant;</li> <li>-acts appropriately during all role plays;</li> <li>- responds frequently to questions;</li> <li>- routinely volunteers point of view.</li> </ul>	<ul style="list-style-type: none"> <li>-often a willing participant;</li> <li>-acts appropriately during role plays;</li> <li>- responds occasionally to questions;</li> <li>-occasionally volunteers point of view.</li> </ul>	<ul style="list-style-type: none"> <li>-rarely a willing participant.</li> <li>-occasionally acts inappropriately during role plays;</li> <li>- rarely able to respond to direct questions;</li> <li>-rarely volunteers point of view .</li> </ul>	<ul style="list-style-type: none"> <li>-never a willing participant</li> <li>- often acts inappropriately during role plays.</li> <li>- never able to respond to direct questions;</li> <li>- never volunteers point of view.</li> </ul>	
Demonstration of professional attitude and demeanor	<ul style="list-style-type: none"> <li>-always demonstrates commitment through thorough preparation;</li> <li>- always arrives on time;</li> <li>- often solicits instructors' perspective outside class.</li> </ul>	<ul style="list-style-type: none"> <li>- rarely unprepared; rarely arrives late;</li> <li>- occasionally solicits instructors' perspective outside class .</li> </ul>	<ul style="list-style-type: none"> <li>-often unprepared; occasionally arrives late;</li> <li>- rarely solicits instructors' perspective outside class .</li> </ul>	<ul style="list-style-type: none"> <li>-rarely prepared;</li> <li>- often arrives late;</li> <li>-never solicits instructors' perspective outside class</li> </ul>	

**Classroom Participation: Oral Presentation**

Element	Excellent			Satisfactory			Needs Improvement			Points
	8	7	6	5	4	3	2	1	0	
<b>Organization</b>	<ul style="list-style-type: none"> <li>There is a logical sequence of information.</li> <li>Title slide and closing slide are included appropriately.</li> </ul>			<ul style="list-style-type: none"> <li>There is some logical sequence of information.</li> <li>Title slide and closing slides are included.</li> </ul>			<ul style="list-style-type: none"> <li>There is little or no logical sequence of information.</li> <li>Title slide and/or closing slides are not included.</li> </ul>			
<b>Slide Design</b> (text, colors, background, illustrations, size, titles, subtitles)	<ul style="list-style-type: none"> <li>Presentation is attractive and appealing to viewers.</li> </ul>			<ul style="list-style-type: none"> <li>Presentation is somewhat appealing to viewers.</li> </ul>			<ul style="list-style-type: none"> <li>Little to no attempt has been made to make presentation appealing to viewers.</li> </ul>			
<b>Content</b>	<ul style="list-style-type: none"> <li>Presentation covers topic completely and in depth.</li> <li>Information is clear, appropriate, and accurate.</li> </ul>			<ul style="list-style-type: none"> <li>Presentation includes some essential information.</li> <li>Some information is somewhat confusing, incorrect, or flawed.</li> </ul>			<ul style="list-style-type: none"> <li>Presentation includes little essential information.</li> <li>Information is confusing, inaccurate, or flawed.</li> </ul>			
<b>Language</b>	<ul style="list-style-type: none"> <li>Spelling, grammar, usage, and punctuation are accurate</li> <li>Fluent and effective</li> </ul>			<ul style="list-style-type: none"> <li>There are minor problems in spelling, grammar, usage, and/or punctuation.</li> </ul>			<ul style="list-style-type: none"> <li>There are persistent errors in spelling, grammar, usage, and/or punctuation.</li> <li>Less or not fluent and effective.</li> </ul>			
<b>Delivery</b>	<ul style="list-style-type: none"> <li>Ideas were communicated with enthusiasm, proper voice projection and clear delivery.</li> <li>There was sufficient eye contact with audience.</li> <li>There was sufficient use of other non-verbal communication skills.</li> </ul>			<ul style="list-style-type: none"> <li>There was some difficulty communicating ideas due to voice projection, lack of preparation, incomplete work, and/or insufficient eye contact.</li> <li>Insufficient use of non-verbal communication skills.</li> <li>Delivery pace is somewhat appropriate.</li> </ul>			<ul style="list-style-type: none"> <li>There was great difficulty communicating ideas due to poor voice projection, lack of preparation, incomplete work, and/or little or no eye contact.</li> <li>No use of non-verbal communication skills.</li> </ul>			

	<ul style="list-style-type: none"> <li>▪ Appropriate delivery pace was used.</li> </ul>		<ul style="list-style-type: none"> <li>▪ Inappropriate delivery pace was used.</li> </ul>	
<b>Interaction with Audience</b>	<ul style="list-style-type: none"> <li>▪ Answers to questions are coherent and complete.</li> <li>▪ Answers demonstrate confidence and extensive knowledge.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Most answers to questions are coherent and complete.</li> <li>▪ Answers somehow demonstrate confidence and extensive knowledge.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Answers to questions are neither coherent nor complete.</li> <li>▪ Is tentative or unclear in responses.</li> </ul>	
	<b>Total Score (Y x 5/16 ) =</b>			