

Course Syllabus

1	Course title	Pharmaceutical Technology I
2	Course number	1212331
3	Credit hours	2 (theory)
	Contact hours (theory, practical)	2 (theory)
	<u>Course Level/Hours</u> according to Jordan National Qualifications Framework (JNQF) Standards	7 th / 75 hr
4	Prerequisites/corequisites	Prerequisite: 1202230 (Pharmaceutical Calculations and Compounding of Dosage Forms)
5	Program title	BSc in Pharmacy and PharmD
6	Program code	
7	Awarding institution	The University of Jordan
8	School	Pharmacy
9	Department	Pharmaceutics and Pharmaceutical Technology
10	Course level	Undergraduate
11	Year of study and semester (s)	First semester of the 3 rd year
12	Other department (s) involved in teaching the course	N/A
13	Main teaching language	English
14	Delivery method	Face to face (Synchronous lecturing)
15	Online platforms(s)	<input checked="" type="checkbox"/> Moodle <input type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....
16	Issuing/Revision Date	08/10/2022

17 Course Coordinator:

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Contact hours:



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18 Other instructors:

Name: Sharif Abdelghany

Office number:

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Email:

Contact hours:

19 Course Description:

Comprehensive survey of industrial processes used in the production of pharmaceuticals. Transfer processes and unit operation with emphasis on subjects of pharmaceutical interests especially tabletting.

20 Course aims and outcomes:

A- Aims:

- To recognize the responsibilities and duties of the departments of a pharmaceutical firm.
- To be able to conduct preformulation studies.
- To recognize various processes and equipment used in the unit operation: particle size analysis, size reduction, mixing and drying.
- To understand the consolidation process of solid dosage forms, and the operation of tablet presses.



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- To recognize various manufacturing methods for solid dosage forms.
- To recognize the ingredients used in the formulation of solid dosage forms.
- To recognize the problems encountered during the manufacturing of solid dosage forms.



B- Students Learning Outcomes (SLOs):

Upon successful completion of this course, students will be able to:

Disriptors	CLO No.	SLOs of the program (PLOs)	Learner	Problem-Solver	Manufacturer	Professional
		SLOs of the course (CLOs)				
Knowledge	K1	Demonstrate the preformulation programs and particles size analysis methods.				
	K2	Determine the operation units and the equipment commonly used in the manufacturing of solid dosage forms.				
	K3	Assess various manufacturing processes for solid dosage forms including wet granulation, dry granulation and direct compression methods.				
Skills	S1	Recommend appropriate remedies for common problems encountered during the manufacturing of solid dosage forms.				
	S2	Develop formulations and manufacturing procedures for solid dosage forms.				
Competencies	C1	Show responsibility, accountability and commitment by complying with tutor's instructions and relevant university regulations				

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome (CLOs)	Learning Methods (Face to Face/Blended / Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Topic 1 Introduction: Extemporaneous dispensing vs. Mass Production, Elements of the manufacturing process, Challenges of mass production.	K1	Face to Face			Exam	Textbook, handouts
	1.2	Product development, Departments of a pharmaceutical firm.	K1	Face to Face			Exam	Textbook, handouts
2	2.1	Topic 2 Preformulation: Definition, Scope: Organoleptic properties, Solubility.	K1	Face to Face			Exam	Textbook, handouts
	2.2	Dissolution, Partitioning, Bulk properties (density, flow, particle size, hygroscopicity, compactability).	K1	Face to Face			Exam	Textbook, handouts
3	3.1	Solid state properties, Stability & compatibility studies.	K1	Face to Face			Exam	Textbook, handouts
	3.2	Topic 3 Particle size analysis: Significance of particles sizing,	K1	Face to Face			Exam/	Textbook,

Week	Lecture	Topic	Student Learning Outcome (CLOs)	Learning Methods (Face to Face/Blended / Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
		Diameter and equivalent diameter, Methods of Particle Size Measurement (Sieve analysis, microscopy).					Quiz	handouts
4	4.1	Methods of Particle Size Measurement (sedimentation methods), Statistical analysis and graphical presentation: Particle Size and Size Distribution, Evaluation of particle sizing data: Normal Distribution.	K1	Face to Face			Exam/Quiz	Textbook, handouts
	4.2	Statistical analysis and graphical presentation: Evaluation of particle sizing data: Skewed Distribution.	K1	Face to Face			Exam/Quiz	Textbook, handouts
5	5.1	Topic 4 Particle Size Reduction: Objectives and applications, Disadvantages, Material properties affecting size reduction, Mechanisms of size reduction.	K2	Face to Face			Exam	Textbook, handouts

Week	Lecture	Topic	Student Learning Outcome (CLOs)	Learning Methods (Face to Face/Blended / Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
	5.2	Size reduction equipment: cutter mill, hammer mill, ball mill	K2	Face to Face			Exam	Textbook, handouts
6	6.1	Size reduction equipment: Fluid energy mill, Oscillating granulator.	K2	Face to Face			Exam	Textbook, handouts
	6.2	Topic 5 Mixing: Definition, Ideal mix vs Random mix, Factors affect mixing process (unit dose size, particle size and distribution, particle shape, mixing time).	K2	Face to Face			Exam	Textbook, handouts
7	7.1	Mechanism of mixing (Diffusion, convection, shear), Segregation (types), Types of mixers	K2	Face to Face			Exam	Textbook, handouts
	7.2	Types of mixers, Testing for blend homogeneity.	K2	Face to Face			Exam	Textbook, handouts
8	8.1	Topic 6 Granulation: Definitions, Reasons for Granulation, Methods of Granulation (Wet and Dry).	K2 & K3	Face to Face			Exam	Textbook, handouts
	8.2	Particle Bonding Mechanisms (Adhesion and cohesion forces in	K2 & K3	Face to Face			Exam	Textbook, handouts

Week	Lecture	Topic	Student Learning Outcome (CLOs)	Learning Methods (Face to Face/Blended / Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
		immobile liquid films, Interfacial forces in mobile liquid films, Solid bridges).						
9	9.1	Mechanism of granule growth, Pharmaceutical Granulation Equipment (Shear granulators, High speed mixer granulators).	K2 & K3	Face to Face			Exam	Textbook, handouts
	9.2	Pharmaceutical Granulation Equipment (Spheronizers / pelletizers). Dry Granulation: sluggers, roller compacters.	K2 & K3	Face to Face			Exam	Textbook, handouts
10	10.1	Topic 7 Drying: Definition, Relative humidity (RH) of air, Equilibrium moisture content, Static Bed Dryers, Intergranular migration of solutes during drying.	K2	Face to Face			Exam	Textbook, handouts
	10.2	Fluidized bed dryers, Intragranular migration of solutes during drying, Spray drying and freeze drying.	K2	Face to Face			Exam	Textbook, handouts

Week	Lecture	Topic	Student Learning Outcome (CLOs)	Learning Methods (Face to Face/Blended / Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
11	11.1	Topic 8 Tableting: Definition, Advantages of tablets, Qualities of a well prepared tablet, Methods of tablet preparation.	K3	Face to Face			Exam/assignment	Textbook, handouts
	11.2	Comparison between granulation and direct compression: cost (equipment and excipient), dose of the API.	K3	Face to Face			Exam/assignment	Textbook, handouts
12	12.1	Comparison between granulation and direct compression: risk of segregation, moisture sensitive API, incompatibility, colorant addition.	K3	Face to Face			Exam/assignment	Textbook, handouts
	12.2	Tableting machines (single punch, rotary).	K3	Face to Face			Exam/assignment	Textbook, handouts
13	13.1	Mechanism of powder compaction.	K3	Face to Face			Exam/assignment	Textbook, handouts

Week	Lecture	Topic	Student Learning Outcome (CLOs)	Learning Methods (Face to Face/Blended / Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
	13.2	Tablet components and excipients.	K3 and S1	Face to Face			Exam/assignment	Textbook, handouts
14	14.1	Tablet components and excipients./ Tableting problems and their remedies, Quality of tablets	K3 and S1	Face to Face			Exam/assignment	Textbook, handouts
	14.2	Tableting problems and their remedies, Quality of tablets.	S1, S2 and C1	Face to Face			Exam/assignment	Textbook, handouts

22 Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	CLOs	Period (Week)	Platform
Midterm Exam	30	Topics 1-5	K1 & K2	8 th week	On campus
Quiz	10	Topic 3	K1	5 th week	On campus
Assignment	10	Topic 8	K3, S1, S2 & C1	12 th week	On campus
Final Exam	50	All Topics	K1, K2, K3, S1 & S2	15 th week	On campus

23 Course Requirements

Students should have:

- Computer
- Internet connection
- Active university account on Moodle (e-learning) website
- Active university account on Microsoft Teams

A Course Policies:

A- Attendance policies: As per the applicable university regulations

B- Absences from exams and handing in assignments on time: As per the applicable university regulations

C- Health and safety procedures: N/A

D- Honesty policy regarding cheating, plagiarism, misbehavior: As per the applicable university regulations

E- Grading policy:

- Midterm exam (30%)
- Course work (20%)
- Final exam (50%)

F- Available university services that support achievement in the course:

- Moodle (e-learning) website



- Microsoft Teams institutional subscription

25 References:

A- Required book(s), assigned reading and audio-visuals:

- Aulton's Pharmaceuticals: The Design and Manufacture of Medicines, by M.E. Aulton and K.M.G. Taylor. 4th Ed., 2013. Published by Churchill Livingstone.

B- Recommended books, materials, and media:

- Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems, by L.V. Allen, N.G. Popovich and H.C. Ansel. 9th Ed., 2011. Published by Lippincott Williams & Wilkins.
- Pharmaceutical dosage forms (Tablet V1, V2 and V3), by H.A. Libberman and L. Lechman. 1990. Published by Marcel Dekker. Inc., N.Y., USA.
- The theory and practice of Industrial Pharmacy, by L. Lechman, H.A. Libberman and J.L. Kanig. 3rd Ed., 1986. Published by Lea and Febiger, Philadelphia, USA.
- Martin's Physical Pharmacy and Pharmaceutical Sciences. 6th Ed., 2011. Published by Lippincott Williams & Wilkins, USA.

26 Additional information:

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Name of Course Coordinator: -----	Signature: -----	Date: -----
Head of Curriculum Committee/Department: -----	Signature: -----	
Head of Department: -----	Signature: -----	
Head of Curriculum Committee/Faculty: -----	Signature: -----	
Dean: -----	Signature: -----	