Philadelphia University	PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	**Approved Date: 10/2022**
Faculty: Pharmacy		**Issue: 1**
Department: -		**Credit Hours: 3**
Academic Year: 2022/2023	**Course Syllabus**	**Bachler:**

Course Information

Course No.	Course Title	Prerequisite
0521533	Advanced drug delivery systems	0510543

Course Type	Class Time	Room No.
☐ Univirsity Requirement ☐ Fuclty Requirement ☐ Major Requirement ☐ Elective ■ Compulsory		

Instructure Information

Name	Office No.	Phone No.	Office Hours	E-mail

Course Delivery Method

☐ Blended	☐ Online	■ Physical
Learning Model		
Percentage	**Synchronous**	**Asynchronous**	**Physical**
	0	**0**	**100%**

Course Description

This This course provides a comprehensive understanding of biopharmaceutical and physicochemical aspects of dosage form design in an integrative manner, utilizing the amount of knowledge that the student has acquired from the previous relevant courses. In addition, this course also discusses the parenteral, nasal and ocular drug delivery. The fundamentals of pharmaceutical nanotechnology as drug delivery systems and the basic principles of delivery of biopharmaceuticals, protein and nucleic acids, will also be briefly cover.

Course Learning Outcomes

Number	Outcome	Corresponding Program Outcomes	Corresponding Program Cometencies
Knowledge			
K1	Gain knowledge related to parenteral , nasal , ocular, pulmonary and buccal routes of administration.	KP1, KP6	C1, C6
K2	Explore the fundamentals of	KP1, KP6	C1, C6

	nanoparticles as drug delivery systems.		
K3	Explore the basic principles of delivery of biopharmaceuticals, protein, vaccines and nucleic acids .	KP1, KP6	C1, C6
Skills			
S1	Perform analysis and interpretation of data related to formulation, production and biopharmaceutical behavior for parenteral, nasal ,ocular, pulmonary and buccal routes of admisteration.	SP2, SP9	C8, C15
S2	Be able to select suitable formulation approaches and production techniques of various delivery systems.	SP2, SP9	C8, C15
S3	Identify and solve problems arising in the pharmaceutical preparation of various delivery dosage forms	SP2, SP9	C8, C15
S4	Demonstrate ability to represent data and prepare relevant reports in a clear systematic way.	SP2, SP9	C8, C15

Learning Resources

Course Textbook	Aulton's Pharmaceutics: The Design and Manufacture of Medicines, Edit.: Michael E. Aulton and Kevin M. G. Taylor. Pub.: Churchill Livingstone, 4nd edition, 2013. ISBN: 978-0-7020-4290-4
Supporting References	1. Martin's Physical Pharmacy and Pharmaceutical Sciences By : Patrick J. Sinko, Lippincott Williams & Wilkins , 2006, 5th Edition 2. Modern Pharmaceutics by Gilbert S. Banker (Editor), Christopher T. Rhodes (Editor) 4th edition (June 15, 2002), Marcel Dekker; ISBN: ISBN: 0824706749 3. Merck Index: An Encyclopedia of Chemicals, Drugs, & Biologicals by Merck, Co, Maryadele J. Oneil (Editor), Ann Smith (Editor) 13th edition (October 2001), Merck & Co; ISBN: 0911910131 4. The Theory and Practice of Industrial Pharmacy by Leon Lachman, Herbert A. Lieberman, Joseph L. Kanig. 3rd edition (August 1986), Lea & Febiger; ISBN: 0812109775 5. Physical Pharmacy: Physical Chemical Principles in the Pharmaceutical Sciences by Alfred Martin, Pilar Bustamante, A.H.C. Chun (Illustrator) 622 pages 4th edition (January 15, 1993), Lea & Febiger; ISBN: 0812114388 6. Handbook of Pharmaceutical Excipients Supporting References Page 3 of 7 by Arthur H. Kibbe (Editor), Ainley Wade, Paul J. Weller 665 pages 3rd edition Vol 3 (January 15, 2000), Amer. Pharmaceutical Assoc.; ISBN: 091733096X 7. Remington: The Science and Practice of Pharmacy by Alfonso R. Gennaro (Editor) 20th edition (December 15, 2000), Lippincott, Williams & Wilkins; ISBN: 0683306472
Supporting Websites	http://library.philadelphia.edu.jo/st_en.htm
Teaching Environment	☒ **Classroom** ☐ **laboratory** ☐ **Learning Platform** ☐ **Other**

Meetings and Subjects Time Table

Week	Topic	Learning Method*	Task	Learning Material

1	Vision and Mission of Faculty of Pharmacy Course syllabus **Parenteral drug delivery:** Reasons for choosing parenteral Administration	Lecture		Vision and Mission of Faculty of Pharmacy Course Syllabus Text book, part 5, Chapter 36
2	Routes of parenteral administration. Pharmacopoeial requirements Absorption from injections sites Excipients. Containeres.	Lecture		Text book, part 5, Chapter 36
3	**Nasal drug delivery:** Anatomy and physiology. Drug delivery. Local delivery Systemic delivery	Lecture	Homework	Text book, part 5, Chapter 38
4	Nasal vaccines CNS delivery Nasal delivery systems	Lecture		Text book, part 5, Chapter 38
5	**Ocular drug delivery:** Anatomy and physiology of the eye Some common ocular conditions and pharmacological interventions. Topical ophthalmic preparations. Formulating ophthalmic preparations. Topical, liquid ophthalmic preparations	Lecture		Text book, part 5, Chapter 41
6	Barriers to topical ocular drug absorption Improving drug solubility and absorption in topical ophthalmic preparations. Sterility of ophthalmic preparations. Ocular drug pharmacokinetics. Targeting the posterior segment of the eye Problems with traditional and new ocular drug delivery systems	Lecture	Short report	Text book, part 5, Chapter 41
7	**Pharmaceutical nanotechnology and nanomedicine** Introduction Applications of pharmaceutical nanotechnology Polymer-drug conjugates Antibodies and antibody-drug conjugates	Lecture	Taped video	Text book, part 5, Chapter 45
8	**Midtern exam**			
9	Dendrimers Micelle systems Solid nanoparticles Liposomes and bilayer vesicles Microcapsules and microspheres Ongoing development	Lecture Collaborative learning	Case study	Text book, part 5, Chapter 45
10	Brief description of some pharmaceutical nanosystems	Lecture		Text book, part 5, Chapter 45
11	**Delivery of biopharmaceuticals**	Lecture		Text book, part 5,

	Introduction Proteins and peptides Vaccines Nucleic acid Covid-19 delivery systems	Project based learning		Chapter 46 (latest literature and marketed emerging products)
12	**Modified release oral dosage forms** **Extended release systems** Hydrophilic matrix Insoluble matrix Membrane controlled systems Osmotic pumps	Lecture Problem solving based learning	Short presentation	Text book, part 5, Chapter 31
13	Gastric retentions (Mucoadhesive, size increasing and floating systems) **Delayed release systems** Gastric resistant systems Colon targeting	Lecture		Text book, part 5, Chapter 31
14	**Pulmonary drug delivery** Anatomy and physiology Formulation of pulmonary formaulations Importance of Aerodynamic size os aorosols	Lecture		Text book, part 5, Chapter 37
15	**Buccal drug delivery** Anatomy and physiology Formulation and delivery systems	Lecture		Review article: https://doi.org/10.1517/17425247.2.3.507
16	**Final exam**			

*Includes: lecture, flipped Class, project based learning, problem solving based learning, collaboration learning.

Course Contributing to Learner Skill Development

Using Technology
• Using Excel to construct tables and plots • Using power point or any other relevant programs for preparing presentations • Operating equipment of granulation and tablet press in addition to tablet quality testing equipment
Communication Skills
• Report writing • Oral presentation of selected topics
Application of Concept Learnt
• Designing new delivery systems according to the physicochemical properties of drugs and the route used for administration.

Assessment Methods and Grade Distribution

Assessment Methods	Grade	Assessment Time (Week No.)	Course Outcomes to be Assessed

Mid Term Exam	**% 30**	**8th week**	K1, K2, K3 S1, S2, S3
Term Works*	**% 30**	**Continous**	S1-S4
Final Exam	**% 40**	**16th week**	K1-K5 S1, S2, S3
Total	**%100**		

* Include: quizzes, in-class and out of class assignment, presentations, reports, videotaped assignment, group or individual project.

Alignment of Course Outcomes with Learning and Assessment Methods

Number	Learning Outcomes	Corresponding Competencies	Learning Method*	Assessment Method**
Knowledge				
K1	Gain knowledge related to parenteral , nasal , ocular, pulmonary and buccal routes of administration.	C1, C6	Lecture Problem solving based learning	Subjective Quiz Exam/Objective questions Homework evaluation Video-taped assignment evaluation
K2	Explore the fundamentals of nanoparticles as drug delivery systems.	C1, C6	Lecture	Exam/Objective questions
K3	Explore the basic principles of delivery of biopharmaceuticals, protein, vaccines and nucleic acids .	C1, C6	Lecture Project based learning	Exam/Objective questions Oral presentation evaluation
Skills				
S1	Perform analysis and interpretation of data related to formulation, production and biopharmaceutical behavior for parenteral, nasal ,ocular, pulmonary and buccal routes of admisteration.	C8, C15	Problem solving based learning	Subjective Quiz Exam/Subjective questions Case study
S2	Be able to select suitable formulation approaches and production techniques of various delivery systems.	C8, C15	Problem solving based learning	Exam/Subjective questions
S3	Identify and solve problems arising in the pharmaceutical preparation of various delivery dosage forms	C8, C15	Problem solving based learning	Exam/Subjective questions
S4	Demonstrate ability to represent data and prepare relevant reports in a clear systematic way.	C8, C15	Problem solving based learning	Report writing Oral presentation evaluation

*Include: lecture, flipped class, project based learning, problem solving based learning, collaboration learning.
** Include: quizzes, in-class and out of class assignments, presentations, reports, videotaped assignments, group or individual projects.

Course Polices

Policy	Policy Requirements
Passing Grade	The minimum pass for the course is (50%) and the minimum final mark is (35%).
Missing Exams	• Anyone absent from a declared semester exam without a sick or compulsive excuse accepted by the dean of the college that proposes the course, a zero mark shall be placed on that exam and calculated in his final mark. • Anyone absent from a declared semester exam with a sick or compulsive excuse accepted by the dean of the college that proposes the course must submit proof of his excuse within a week from the date of the excuse's disappearance, and in this case, the subject teacher must hold a compensation exam for the student. • Anyone absent from a final exam with a sick excuse or a compulsive excuse accepted by the dean of the college that proposes the material must submit proof of his excuse within three days from the date of holding that exam.
Attendance	The student is not allowed to be absent more than (15%) of the total hours prescribed for the course, which equates to six lecture days (n t) and seven lectures (days). If the student misses more than (15%) of the total hours prescribed for the course without a satisfactory or compulsive excuse accepted by the dean of the faculty, he is prohibited from taking the final exam and his result in that subject is considered (zero), but if the absence is due to illness or a compulsive excuse accepted by the dean of the college that The article is introduced, it is considered withdrawn from that article, and the provisions of withdrawal shall apply to it.
Academic Integrity	Philadelphia University pays special attention to the issue of academic integrity, and the penalties stipulated in the university's instructions are applied to those who are proven to have committed an act that violates academic integrity, such as cheating, plagiarism (academic theft), collusion, intellectual property rights.

Program Learning Outcomes to be Assessed in this Course

Number	Learning Outcome	Course Title	Assessment Method	Targeted Performance level

Description of Program learning Outcomes Assessment Method

Number	Detailed Description of Assessment

Assessment Rubric of the Program Learning Outcomes