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| Philadelphia University |  <b>PHILADELPHIA UNIVERSITY</b><br><small>THE WAY TO THE FUTURE</small> | Approved Date:<br>10/2022 |
| Faculty: Pharmacy       |  | Issue: 1                  |
| Department: -           |  | Credit Hours: 3           |
| Academic Year:2022/2023 |  | <b>Course Syllabus</b>    |

### Course Information

| Course No.  | Course Title   | Prerequisite                 |          |
|---|--|------------------------------|----------|
| 0520420   | Industrial Pharmacy  | Pharmaceutics (II) (0520322) |          |
| Course Type   |  | Class Time                   | Room No. |
| <input type="checkbox"/> University Requirement       | <input type="checkbox"/> Faculty Requirement                                     | 9:45-11:15<br>Sun, Tue       | 5620     |
| <input checked="" type="checkbox"/> Major Requirement | <input type="checkbox"/> Elective <input checked="" type="checkbox"/> Compulsory | 8:15-9:45<br>Mon, Wed        | 5620     |
|   |  | 8:15-9:45<br>Mon, Wed        | 5614     |

### Instructure Information

| Name              | Office No. | Phone No.                 | Office Hours                                      | E-mail                     |
|-------------------|------------|---------------------------|---|----------------------------|
| Dr Mohammad Bayan | 5532       | +9622637444<br>Ext.: 2227 | 11:15-12:15<br>Sun, Tue<br>9:45-10:45<br>Mon, Wed | mbayan@philadelphia.edu.jo |

### Course Delivery Method

| <input type="checkbox"/> Blended <input type="checkbox"/> Online <input checked="" type="checkbox"/> Physical |             |              |          |
|---|-------------|--------------|----------|
| Learning Model  |             |              |          |
| Percentage  | Synchronous | Asynchronous | Physical |
|   | 0           | 0            | 100%     |

### Course Description

This course will introduce the student to the basic concepts of particle sizing, its importance in pharmaceutical technology and methods used to either achieve that or measure it. Pharmaceutical industrial processes will be discussed in some details like drying, mixing, filtration and powder fluidity. The student will apply the knowledge to the pharmaceutical technology methods used in formulating and pre-formulating several dosage forms.

## Course Learning Outcomes

| Number           | Outcome  | Corresponding Program Outcomes     | Corresponding Competencies |
|------------------|--|------------------------------------|----------------------------|
| <b>Knowledge</b> |  |                                    |                            |
| <b>K1</b>        | Understand pharmaceutical operations in industrial pharmacy regarding unit operations including particle size reduction, mixing, drying and filtration/centrifugation. | K <sub>P</sub> 1, K <sub>P</sub> 6 | C1, C6                     |
| <b>K2</b>        | Understand the basis of powder flow, its characterization and relation to the manufacture of solid dosage forms.   | K <sub>P</sub> 1, K <sub>P</sub> 6 | C1, C6                     |
| <b>K3</b>        | Gain knowledge related to the concept of particle size, particle size measurement and its relevance to the drug manufacture and performance.                           | K <sub>P</sub> 1, K <sub>P</sub> 6 | C1, C6                     |
| <b>K4</b>        | Describe pharmaceutical equipment and apparatus used in the pharmaceutical production and problems rising with their use.  | K <sub>P</sub> 1, K <sub>P</sub> 6 | C1, C6                     |
| <b>Skills</b>    |  |                                    |                            |
| <b>S1</b>        | Differentiate between, and accordingly choose, techniques and machines used to achieve specific steps in pharmaceutical formulation.                                   | S <sub>P</sub> 2, S <sub>P</sub> 9 | C8, C15                    |
| <b>S2</b>        | Identify and solve problems arising from performing certain unit operations.   | S <sub>P</sub> 2                   | C8                         |
| <b>S3</b>        | Compare between different methods used to evaluate powder flowability to select suitable methods for specific situations.  | S <sub>P</sub> 2, S <sub>P</sub> 9 | C8, C15                    |
| <b>S4</b>        | Perform calculation and data analysis related to particle size analysis and powder flow assessment.  | S <sub>P</sub> 2                   | C8                         |

## Learning Resources

|                        |  |
|------------------------|--|
| <b>Course Textbook</b> | <b>Aulton's Pharmaceutics, The Design and Manufacture of Medicines, Edit.: Michael E. Aulton, Kevin M. G. Taylor Pub.: Churchill Livingstone, 5th edition, 2018.</b> |
|------------------------|--|

|                              |   |
|------------------------------|---|
| <b>Supporting References</b> | <ol style="list-style-type: none"> <li>1. Pharmaceutical Dosage Forms and Drug Delivery Systems by Loyd V. Allen, Jr, Wolters Kluwer ,11th Edition ,2018</li> <li>2. Modern Pharmaceutics by Gilbert S. Banker (Editor), Christopher T. Rhodes (Editor) 4th edition (June 15, 2002), Marcel Dekker; ISBN: 0824706749</li> <li>3. Merck Index: An Encyclopedia of Chemicals, Drugs, &amp; Biologicals by Merck, Co, Maryadele J. Oneil (Editor), Ann Smith (Editor) 13th edition (October 2001), Merck &amp; Co; ISBN: 0911910131</li> <li>4. The Theory and Practice of Industrial Pharmacy by Roop Krishen Khar, S. P. Vyas, Farhan J. Ahmad, Gaurav K. Jain. 4th edition(2015), CBS; ISBN: 9788123922898</li> <li>5. Martin's physical pharmacy and pharmaceutical sciences: physical chemical and biopharmaceutical principles in the pharmaceutical sciences, By : Patrick J. Sinko, Lippincott Williams &amp; Wilkins , 2017; ISBN: 9781496353443</li> <li>6. Remington: The Science and Practice of Pharmacy by David B. Troy (Editor), Publisher: Lippincott Williams &amp; Wilkins; 21st edition (May 28, 2005) ISBN: 0781746736</li> </ol> |
| <b>Supporting Websites</b>   | <a href="http://library.philadelphia.edu.jo/st_en.htm">http://library.philadelphia.edu.jo/st_en.htm</a>   |
| <b>Teaching Environment</b>  | <input checked="" type="checkbox"/> Classroom <input type="checkbox"/> laboratory <input type="checkbox"/> Learning Platform <input type="checkbox"/> Other   |

## Meetings and Subjects Timetable

| Week | Topic   | Learning Method*                              | Task         | Learning Material                                  |
|------|---|---|--------------|--|
| 1    | <b>Course Syllabus</b><br><br><b>Particle size analysis:</b> Importance. Equivalent diameters. Particle size distribution.                              | Lecture<br><br>Flipped learning               |              | Course Syllabus<br><br>Textbook, part 2, Chapter 8 |
| 2    | Statistics related to particle size. Methods of particle size analysis.   | Lecture<br><br>Problem solving based learning | Short report | Textbook, part 2, Chapter 9                        |
| 3    | <b>Size reduction:</b><br>Objectives.<br>Influence of material properties.<br>Energy requirements.<br>Effect of size reduction on size distribution.    | Lecture                                       |              | Textbook, part 2, Chapter 10                       |
| 4    | Methods of size reduction.  | Lecture<br><br>Collaborative learning         | Case study   | Textbook, part 2, Chapter 10                       |
| 5    | <b>Mixing:</b> Importance. Definition and objectives. Types of mixtures. Mixing process and its mathematical treatment. Evaluation of degree of mixing. | Lecture                                       |              |  |
| 6    | Mechanisms of mixing. Powder segregation<br>Ordered mixing.   | Lecture                                       |              | Textbook, part 2, Chapter 11                       |
| 7    | Equipments of powder mixing. Equipments of liquids mixing.<br>Equipments of semisolids mixing.  | Lecture<br><br>Problem solving based learning | Homework     |  |
| 8    | <b>Powder flow:</b> Measurement of adhesion and cohesion. Particle properties and bulk flow.  | Lecture                                       |              | Textbook, part 2, Chapter 12                       |
| 9    | Packing geometry.<br>Flow through an orifice.<br>Mass and funnel flow.  | Lecture                                       |              |  |
| 10   | Characterization of Powder Flow.<br>Improvement of Powder Flow.   | Lecture<br><br>Collaborative learning         | Case study   |  |
| 11   | Midterm Exam<br><b>Drying:</b> Moisture content of wet solids. Loss of water from wet solids.   | Lecture                                       |              | Textbook, part 5, Chapter 29                       |
| 12   | Types of drying methods Rate of drying in fixed beds.   | Lecture                                       |              |  |
| 13   | Convective drying.<br>Conductive drying.  | Lecture                                       |              |  |

|           |   |                                       |                    |                                 |
|-----------|---|---------------------------------------|--------------------|---------------------------------|
|           | Radiation drying.   |                                       |                    |                                 |
| <b>14</b> | Dryers for dilute solutions and suspensions.<br>Freeze drying.<br>Solute migration during drying. | Lecture<br><br>Project based learning | Short presentation |                                 |
| <b>15</b> | <b>Clarification:</b><br>Filtration.<br>Centrifugation.   | Lecture                               |                    | Textbook, part 5,<br>Chapter 25 |
| <b>16</b> | <b>Final Exam Week</b>  |                                       |                    |                                 |

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

## Course Contributing to Learner Skill Development

| Using Technology   |
|--|
| <ul style="list-style-type: none"> <li>• Represent data in tabular and graphical manners.</li> <li>• Perform good analysis for the represented data and calculate related statistical values.</li> <li>• Come out with the best interpretation and understanding of machinery-produced data and graph sheets.</li> <li>• Be able to search and extract relevant information from literature.</li> </ul>  |
| Communication Skills   |
| <ul style="list-style-type: none"> <li>• Be able to represent and explain various issues related to the pharmaceutical operations in industrial manufacture of drug products.</li> <li>• Demonstrate ability to prepare relevant reports in a clear systematic way.</li> <li>• Be able to adapt and accommodate team working.</li> <li>• Access resources related to the description and application of the methods used for various unit operations.</li> </ul> |
| Application of Concept Learnt  |
| <ul style="list-style-type: none"> <li>• Application of preformulation considerations during the development of solid dosage forms in the corresponding practical course.</li> </ul>   |

### Assessment Methods and Grade Distribution

| Assessment Methods   | Grade       | Assessment Time (Week No.)  | Course Outcomes to be Assessed |
|----------------------|-------------|-----------------------------|--------------------------------|
| <b>Mid Term Exam</b> | <b>% 30</b> | <b>11<sup>th</sup> week</b> | <b>K1, K3, K4, S1, S2, S4</b>  |
| <b>Term Works*</b>   | <b>% 30</b> | <b>Continuous</b>           | <b>S1-S4</b>                   |
| <b>Final Exam</b>    | <b>% 40</b> | <b>16<sup>th</sup> week</b> | <b>K1-K4 S1- S4</b>            |
| <b>Total</b>         | <b>%100</b> |                             |                                |

\* 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**  |
|------------------|---|----------------------------|---|--|
| <b>Knowledge</b> |   |                            |   |  |
| <b>K1</b>        | Understand pharmaceutical operations in industrial pharmacy regarding unit operations including particle size reduction, mixing, drying and filtration/centrifugation | C1, C6                     | Lecture<br><br>Problem solving based learning | Exam/Quiz questions<br><br>in-class and out of class assignments |

|               |  |         |  |   |
|---------------|--|---------|--|---|
| <b>K2</b>     | Understand the basis of powder flow, its characterization and relation to the manufacture of solid dosage forms.                             | C1, C6  | Lecture<br>Project based learning  | Exam/Quiz questions<br>Case study                             |
| <b>K3</b>     | Gain knowledge related to the concept of particle size, particle size measurement and its relevance to the drug manufacture and performance. | C1, C6  | Lecture<br>Problem solving based learning                                    | Exam/Quiz questions<br>Short report                           |
| <b>K4</b>     | Describe pharmaceutical equipment and apparatus used in the pharmaceutical production and problems rising with their use.                    | C1, C6  | Lecture<br>Collaborative learning  | Exam/Quiz questions<br>Case study                             |
| <b>Skills</b> |  |         |  |   |
| <b>S1</b>     | Differentiate between, and accordingly choose, techniques and machines used to achieve specific steps in pharmaceutical formulation.         | C8, C15 | Problem solving based learning<br>Project-based learning<br>Flipped learning | Exam/Quiz questions<br>Presentation<br>videotaped assignments |
| <b>S2</b>     | Identify and solve problems arising from performing certain unit operations.   | C8      | Problem solving based learning<br>Project based learning                     | Exam/Quiz questions<br>in-class and out of class assignments  |
| <b>S3</b>     | Compare between different methods used to evaluate powder flowability to select suitable methods for specific situations.                    | C8, C15 | Problem solving based learning<br>Collaborative learning                     | Exam/Quiz questions<br>Case study                             |
| <b>S4</b>     | Perform calculation and data analysis related to particle size analysis and powder flow assessment.  | C8      | Problem solving based learning   | Exam/Quiz questions<br>in-class and out of class assignments  |

\*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  |
|----------------------|--|
| <b>Passing Grade</b> | The minimum pass for the course is (50%) and the minimum final mark is (35%).  |
| <b>Missing Exams</b> | <ul style="list-style-type: none"> <li>• 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.</li> <li>• Anyone absent from a declared semester exam with a sick or</li> </ul> |

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|                           | <p>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.</p> <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |
| <b>Attendance</b>         | <p>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.</p> |
| <b>Academic Integrity</b> | <p>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.</p>   |

### 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 |
|--------|------------------------------------|
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### Assessment Rubric of the Program Learning Outcomes

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