| Course Plan for Bachelor Program - Study Plan Development and Updating Procedures/ Pharmacy Department | QF02/0408-4.0E |
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|---|---|---|---|---|---|---|
| **Study Plan No.** | **2021/2022** | | **University Specialization** | | **Bachelor of Pharmacy** | |
| **Course No.** | **0201548** | | **Course Name** | | **Drug Delivery** | |
| **Credit Hours** | **3** | | **Prerequisite *Co-requisite** | | **Pharmaceutical Technology** | |
| **Course Type** | ☐ Mandatory University Requirement | ☐ University Elective Requirement | ☐ Faculty Mandatory Requirement | ☐ Support course family requirements | ☑ Mandatory Requirement | ☐ Elective Requirement |
| **Teaching Style** | ☐ Full Online Learning | | ☑ **Blended Learning** | | ☐ Traditional Learning | |
| **Teaching Model** | ☐ 1 Synchronous: 1 Asynchronous | | ☑ **1 Face to Face: 1 Asynchronous** | | ☐ 2 Traditional | |

## Faculty Member and Study Divisions Information *(to be filled in each semester by the subject instructor)*

| Name | Academic rank | Office No. | Phone No. | E-mail | |
|---|---|---|---|---|---|
| | | | | | |
| **Office Hours (Days/Time)** | **Sunday, Tuesday, Thursday ()** | | **Monday, Wednesday ()** | | |
| **Division number** | **Time** | **Place** | **Number of Students** | **Teaching Style** | **Approved Model** |
| | | | | **Blended Learning** | **1 Face to Face: 1 Asynchronous** |

## Brief Description

This course will discuss the engineering of different pharmaceutical delivery systems, with an emphasis on the design and application of materials that overcome the various biological delivery barriers.

## Learning Resources

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|---|---|---|---|---|
| **Course Book Information** (Title, author, date of issue, publisher ... etc) | 1. Aulton's Pharmaceutics: The Design and Manufacture of Medicines, M. E. Aulton and K. M. G. Taylor, 5th Edition, 2017, Churchill Livingstone.<br>2. Martin's Physical Pharmacy and Pharmaceutical Sciences, P.J. Sinko, 6th Edition, 2016, Lippincott Williams & Wilkins.. | | | |
| **Supportive Learning Resources** (Books, databases, periodicals, software, applications, others) | - Selected review articles from the literature. | | | |
| **Supporting Websites** | | | | |
| **The Physical Environment for Teaching** | ☑ **Classroom** | ☐ Labs | ☑ **Virtual Educational Platform** | ☐ Others |
| **Necessary Equipment and Software** | - PC/laptop with headphones and camera.<br>- Microsoft Office.<br>- Moodle. | | | |

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| **Supporting People with Special Needs** | |
| **For Technical Support** | E-Learning & Open Educational Resources Center.<br>Email: elearning@zuj.edu.jo; Phone: +962 6 429 1511 ext. 425/362. |

## Course learning outcomes *(K= Knowledge, S= Skills, C= Competencies)*

| No. | Course Learning Outcomes | The Associated Program Learning Output Code |
|---|---|---|
| **Knowledge**<br>**The student should be able to:** | | |
| **K1** | Describe the attributes and limitations of the gastrointestinal, pulmonary, nasal, and mucosal barriers relevant to drug absorption. | **MK2** |
| **K2** | Compare the different types of modified release oral dosage forms. | **MK2** |
| **K3** | Outline the various types of nanocarriers and their applications in targeted drug delivery. | **MK2** |
| **K4** | Recognize the formulation approaches for efficient delivery of biologics. | **MK2** |
| **Skills**<br>**The student should be able to:** | | |
| **S1** | Design the appropriate modified release dosage form to achieve the desired clinical goal. | **MS4** |
| **S2** | Determine the formulation requirements to bypass the pulmonary, nasal, and mucosal barriers. | **MS4** |
| **S3** | Find formulation solutions to improve the delivery efficacy of biologics. | **MS4** |
| **Competencies**<br>**The student should be able to:** | | |
| **C1** | Educate audiences through a multimedia presentation about a current topic in drug delivery. | **MC2, MC3** |
| **C2** | Demonstrate creative thinking in solving drug delivery-related problems. | **MC3** |

## Mechanisms for Direct Evaluation of Learning Outcomes

| Type of Assessment / Learning Style | Fully Electronic Learning | Blended Learning | Traditional Learning (Theory Learning) | Traditional Learning (Practical Learning) |
|---|---|---|---|---|
| **Midterm Exam** | 30% | **30%** | 30% | 0% |
| **Participation / Practical Applications** | 0% | **0%** | 20% | 50% |
| **Asynchronous Interactive Activities** | 20% | **20%** | 0% | 0% |
| **Final Exam** | 50% | **50%** | 50% | 50% |

***Note 1:*** *Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.*

***Note 2:*** *According to the Regulations of granting Master's degree at Al-Zaytoonah University of Jordan, 40% of final evaluation goes for the final exam, and 60% for the semester work (examinations, reports, research or any scientific activity assigned to the student).*

## Schedule of Simultaneous / Face-to-Face Encounters and their Topics

| Week | Subject | Learning Style* | Reference ** |
|---|---|---|---|
| **1** | Introduction to drug delivery systems | Lecture<br>Participatory learning | Ref. 2, pp. 594-608 |
| **2** | Oral drug delivery (hard and soft capsules) | Lecture<br>Participatory learning | Ref. 1, pp. 583-609 |
| **3** | Oral drug delivery (modified release systems) | Lecture<br>Participatory learning | Ref. 1, pp. 550-564 |
| **4** | Oral drug delivery (modified release systems) | Lecture<br>Participatory learning<br>Problem-based learning | Ref. 1, pp. 550-564 |
| **5** | Pulmonary drug delivery | Lecture<br>Participatory learning | Ref. 1, pp. 638-656 |
| **6** | Pulmonary drug delivery | Lecture<br>Participatory learning<br>Problem-based learning | Ref. 1, pp. 638-656 |
| **7** | Nasal drug delivery | Lecture<br>Participatory learning | Ref. 1, 657-674 |
| **8** | Mucosal drug delivery | Lecture<br>Participatory learning | Selected review articles |
| **9** | Nanotechnology and targeted drug delivery<br>**Midterm Exam** | Lecture<br>Participatory learning<br>Problem-based learning | Ref. 1, pp. 777-795<br>Ref. 2, pp. 612-619 |
| **10** | Lipid-based nanoparticles | Lecture<br>Participatory learning | Selected review articles |
| **11** | Polymer-drug conjugates | Lecture<br>Participatory learning | Selected review articles |
| **12** | Polymeric nanoparticles and micelles | Lecture<br>Participatory learning | Selected review articles |
| **13** | Inorganic nanoparticles | Lecture<br>Participatory learning | Selected review articles |
| **14** | Stimuli-responsive drug delivery | Lecture<br>Participatory learning | Selected review articles |
| **15** | Gene and protein delivery | Lecture<br>Participatory learning<br>Problem-based learning | Ref. 1, pp. 797-809 |

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|---|---|---|---|
| **16** | **Final Exam** | | |

** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.*
*** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.*

## Schedule of Asynchronous Interactive Activities *(in the case of e-learning and blended learning)*

| Week | Task / Activity | Reference | Expected Results |
|---|---|---|---|
| 1 | Watch a recorded lecture | Video on the E-learning platform | Answer questions embedded in the video |
| 2 | Watch a recorded lecture | Video on the E-learning platform | Answer questions embedded in the video |
| 3 | Assigning groups and topics for the multimedia presentation | - | Students will be divided into groups and each group will work on a topic for the presentation |
| 4 | Assignment (1) - Case study on modified release | Assignment on the E-Learning platform | Assignment marked out of 5 |
| 5 | Watch a recorded lecture | Video on the E-learning platform | Answer questions embedded in the video |
| 6 | Online meeting for student groups to work on the presentation | - | A group representative will report progress to the instructor |
| 7 | Watch a recorded lecture | Video on the E-learning platform | Answer questions embedded in the video |
| 8 | Online meeting for student groups to work on the presentation | - | A group representative will report progress to the instructor |
| 9 | **Midterm Exam** | - | - |
| 10 | Watch a recorded lecture<br>Assignment (2) - Prodrugs | Video and assignment on the E-learning platform | Assignment marked out of 5 |
| 11 | Online meeting for student groups to work on the presentation | - | A group representative will report progress to the instructor |
| 12 | Online meeting for student groups to work on the presentation | - | A group representative will report progress to the instructor |
| 13 | Group presentations | - | Presentations marked out of 20 |
| 14 | Group presentations | - | Presentations marked out of 20 |
| 15 | Group presentations | - | Presentations marked out of 20 |
| 16 | **Final Exam** | | |