



***The University of Jordan
Accreditation & Quality Assurance Centre***

Course Syllabus

Practical Pharmaceutical Technology II

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|-----|---|--|
| 1 | Course title | <i>Practical Pharmaceutical Technology II</i> |
| 2 | Course number | 1202334 |
| 3 | Credit hours (theory, practical) | 1 (Practical) |
| | Contact hours (theory, practical) | 3 (Practical) |
| 4 | Prerequisites/Co-requisites | <i>Pharmaceutical Technology I (1212331)/ Pharmaceutical Technology II (1202333)</i> |
| 5 | Program title | <i>BSc Pharmacy</i> |
| 6 | Program code | NA |
| 7 | Awarding institution | <i>The University of Jordan</i> |
| 8 | Faculty | <i>School of Pharmacy</i> |
| 9 | Department | <i>Department of Pharmaceutics and Pharmaceutical Technology</i> |
| 10 | Level of course | <i>Undergraduate</i> |
| 11 | Year of study and semester (s) | <i>Second semester of the 3rd year</i> |
| 12 | Final Qualification | <i>Pharmacist</i> |
| 13 | Other department (s) involved in teaching of the course | NA |
| 14 | Language of Instruction | <i>English</i> |
| 15 | Date of Production / revision | <i>October 2020</i> |
| 16. | Teaching Methodology | <i>E-learning (Moodle) [for material & activities]</i> |
| 17 | Platform | <i>Microsoft Teams (for synchronous meeting)</i> |

NB:

Course Coordinator and the other instructor/s information will be added at the beginning of each semester

18. Course Description:Description

The series of practical classes provides advanced skills in the area of pharmaceutical technology and has particular emphasis on the methods, materials and testing procedures associated with the manufacture of pharmaceutical grade tablets, Solubility and solubilization: effect of chemical structure, effect of pH, salt formation, and cosolvent approach and Emulsions: definition, types of emulsions, pharmaceutical applications, destabilization mechanism (thermodynamic stability: Stokes law and physical stability: creaming, coalescence and phase separation), and Stabilization mechanisms. Experiments illustrate the solubility properties of substances, Sugar Coating and Aqueous Film Coating Techniques, Dissolution of Dosage Forms, and Emulsions Stabilization.

Methodology

This Course is offered as a blended learning (BL) course, where Face-to-Face and Rotation models are being utilized. Here the students are directed by their instructor, and asked to study and read, online content (videos, pre session educational material, and sometimes websites) outside the class room, then assessed via online quizzes using the Moodle (e-learning). These

activities are done prior to the weekly practical session, and during the 3-hour weekly meeting (practical session) each student is asked to apply/perform the experiment, then discuss outcomes/results with instructor and colleagues in the same group and other groups. Students are evaluated by their instructor during the practical session on applying what they had watched prior to session.

19. Course Aims and Outcomes:

A. Aims:

1. To be able to conduct pre-formulation studies: Solubility and Solubilization.
2. To recognize the pre-formulation and formulation of small volume Parenteral Dosage Forms.
3. To understand various manufacturing methods and processes of coating of Solid Dosage Forms.
4. To recognize various ingredients and formulation processes of Functional Film Coating Liquids.
5. To recognize equipment and techniques used in Tablets Coating.
6. To recognize the various problems encountered during coating of solid dosage forms/Tablets.
7. To evaluate physical and release properties of enteric coated tablets/solid dosage forms.
8. To recognize and understand manufacturing/preparation process, application, formulation methods of Emulsions.

B. Course Intended Learning outcomes (ILOs):

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

- Develop, integrate, and apply knowledge from the foundational sciences (Biomedical sciences, Pharmaceutical sciences, Clinical sciences, Social/behavioral/administrative); *Learner*.
 1. Describe the physicochemical principles of drugs to be formulated as parenteral solutions.
 2. Acquire the knowledge of the physicochemical properties of polymers used in tablets coating.
 3. Determine the drug solubility in various media for the purpose of formulation as parenteral solution.
 4. Identify the ingredients used in parenteral product formulation.
 5. Recognize various problems encountered during tablets coating.
 6. Recognize reason/s why some drugs are formulated as emulsion.
 7. Classify different emulsions according to their types.
 8. Define and apply various approaches to stabilize emulsions, e.g. HLB method.
 9. Select the correct polymer for specific coating function; such as enteric coating and sustained release coating.
 10. Utilize coating equipment and tools; such as pan coater and atomization/spraying gun.
 11. Choose appropriately various ingredients for coating formulation.
 12. Select the correct ingredients for emulsions formulation.
 13. Correlate the solubility with different APIs chemical structure.
 14. Evaluate the release properties of functional coating (Enteric Coated Tablets).
 15. Assess the destabilization mechanisms of different types of emulsions.
- Dispense, compound, distribute, and manage so as to operate a successful pharmacy outlet/store; *Pharmacy System Manager*.
 16. Develop and provide accurate and usable dosage forms information regarding dosing and use instructions.
 17. Utilize proper documentation in management.

- Carry out compounding procedures to produce an effective and safe medicine (Compounder), and implement quality control measures and tests (Quality Manager); *Pharmaceutical Product Expert Manufacturer*.
 18. Recommend formulations for different types of pharmaceutical emulsions.
 19. Propose and design proper packaging materials used for parenteral products.
 20. Inspect problems encountered during the formulation of parenteral products.
 21. Suggest coating formulations ingredients and quantities with the necessary calculations.
 22. Develop remedies for tablets coating problems.
 23. Solve problems encountered during emulsions manufacturing and stability studies final emulsion.
- Interpret results derived experimentally or by simulation, summarize and present experimentally or simulated derived data, write a scientifically sound report of an experiment, and utilize IT in data management and presentation; *Simulated/Experimental Data Manager*.
 24. Summarize and present the data obtained from the unit operation unit, such as particle size analysis after size reduction.
 25. Interpret and analyze experimentally derived data.
 26. Build and compile scientific reports for experiments.
 27. Utilize *Microsoft Excel*® for experimental data management and presentation.
- Identify problems; explore and prioritize potential strategies; and design, implement, and evaluate a viable solution; *Problem Solving and critical thinking (Problem Solver)*.
 28. Identify key elements of problems and choose appropriate methods for their resolution in a considered manner.
 29. Outline and solve the problems encountered coating processes of pharmaceutical dosage forms in pharmaceutical firms.
 30. Propose solutions for problems encountered during preparation of parenteral solutions, tablets coating, and emulsions formulation.
 31. Suggest methods for solubility enhancement of APIs.
- Demonstrate self-directed learning through ongoing reflection and analysis to identify areas and methods necessary to expand professional knowledge and competence in a changing practice environment; *Self-learner*.
 32. Seek proactively new knowledge related to particles and dosage forms testing and their management using official Pharmacopeia and through browsing the internet based professional website.
- Communicate effectively with patients, caregivers, pharmacy personnel, other health care professionals, community members, policy makers and administrators; *communicator*.
 33. Adapt to work independently and interact effectively within a team/learning group, giving and receiving information and ideas, and modifying responses where appropriate.
 34. Communicate effectively in a manner appropriate to the discipline(s) and report practical procedures in a clear and concise manner in a variety of formats.
 35. Develop skills and confidence required for assertive, persuasive, and clear communications.
- Exhibit behaviors and values that are consistent with the trust given to the profession by patients, other healthcare providers, and society; *Professional*.
 36. Demonstrate integrity by not cheating and not committing plagiarism.
 37. Demonstrate respect to professors and classmates by observing active listening inside the classroom

38. Evaluate own strengths and weaknesses, challenge received, and develop own criteria and judgment.

39. Acquire analytical skills to work with people and adapt quickly to working environment in pharmaceutical firms.

- *Team Working and Leadership*

40. *Develop and show qualities and skills to integrate, work, and coordinate with people in a team.*

C. **Program Competencies Achieved:**

1. **Learner:** Develop, integrate, and apply knowledge from the foundational sciences (Biomedical sciences, Pharmaceutical sciences, Clinical sciences, Social/behavioral/administrative).

2. **Pharmacy System Manager:** Dispense, compound, distribute, and manage so as to operate a successful pharmacy outlet/store.

3. **Pharmaceutical Product Expert (Manufacturer):** Carry out compounding procedures to produce an effective and safe medicine (Compounder), and implement quality control measures and tests (Quality Manager).

4. **Simulated/Experimental Data Manager:** Interpret results derived experimentally or by simulation, summarize and present experimentally or simulated derived data, write a scientifically sound report of an experiment, and utilize IT in data management and presentation.

5. **Problem Solving and critical thinking (Problem Solver):** Identify problems; explore and prioritize potential strategies; and design, implement, and evaluate a viable solution.

6. **Self-learner:** Demonstrate self-directed learning through ongoing reflection and analysis to identify areas and methods necessary to expand professional knowledge and competence in a changing practice environment.

7. **Communicator:** Communicate effectively with patients, caregivers, pharmacy personnel, other health care professionals, community members, policy makers and administrators.

8. **Professional:** Exhibit behaviors and values that are consistent with the trust given to the profession by patients, other healthcare providers, and society.

9. **Team Working**

10. **Leadership**

20. Topic Outline and Schedule*:

| Topic | Week | Teaching Methodology | | Achieved ILO/ILOs | Evaluation Method/s | Reference |
|---|-------|---|--------------------------------------|---|--|---|
| | | Online Part | Face-to-Face Part | | | |
| Orientation & Introduction to general Laboratory Instructions. | 1 | <i>Synchronous (Microsoft TEAMS) & Video** about the topic</i> | | 36-39 | Oral Discussion Practical Session Weekly Evaluation | Laboratory Manual |
| <ul style="list-style-type: none"> Revision of (How to report data (Reports components and writing, How to prepare Laboratory Log-books, and How to construct "Student Portfolio"). From PPT I. Introduction to Buffer Solutions (Concept, calculations, & preparation methods) | 2 | <i>Synchronous (Microsoft TEAMS) & Two Videos** One includes power points slide show and word documents about Portfolio preparation and a video includes prelab material and required information prior to the 4-week cycle</i> | | 16, 17, 24-27, 33-35, 39 | Portfolio (Reports, Log-book), Pre-lab Assessment (Moodle-based quizzes) | Instructor, & Reports, Log-book, & Portfolio templates & models Videos |
| Solubilization of Mefenamic Acid: pH-Solubility Profile | 3 & 4 | <i>Video**of the experiment</i> | Application of the experiment | 1, 3, 4, 13, 16, 17, 19, 20, 24-27, 28-31, 32, 33-35, 36-39, 40 | Oral Discussion, Practical Session Weekly Evaluation, Portfolio construction (Reports & Data Analysis, Log-book), Pre-lab Assessment (Moodle-based quizzes), & Examinations | Laboratory Manual, General References provided below Videos |
| Solubilization of Mefenamic Acid: Effect of Co-solvent | 4 & 5 | <i>Video**of the experiment</i> | Application of the experiment | 1, 3, 4, 13, 16, 17, 19, 20, 24-27, 32, 28-31, 33-35, 36-39, 40 | | |
| Solubilization of Mefenamic Acid: Salt Formation | 5 & 6 | <i>Video**of the experiment</i> | Application of the experiment | 1, 3, 4, 13, 16, 17, 19, 20, 24-27, 28-31, 32, 33-35, 36-39, 40 | | |
| Midterm Examination | 7 | | | | | |
| Introduction to Tablets Coating & Sugar Coating | 8 | <i>Video** includes data the should be known</i> | Discussion about coating and | 2, 5, 9, 10, 11, 14, 16, 17, 21, 22, 24-27, 33-35, 40 | Oral Discussion, Practical Session Weekly | Laboratory Manual, General |

| | | | | | | |
|--|---------|--|---|--|--|--|
| | | <i>about coating, in general, and sugar coating and press coating</i> | explanation of film coating related calculations | | Evaluation, Portfolio construction (Reports & Data Analysis, Log-book), Pre-lab Assessment (Moodle-based quizzes), & Examinations | References provided below Videos |
| Aqueous Film Coating | 9 & 10 | <i>Video**of the experiment</i> | Application of the experiment | 2, 5, 9, 10, 11, 14, 16, 17, 21, 22, 24-27, 28-31, 33-39, 40 | | |
| Dissolution of Enteric Coated Tables | 9 & 10 | <i>Video**of the experiment</i> | Application of the experiment | 2, 5, 9, 10, 11, 14, 16, 17, 21, 22, 24-27, 28-31, 33-35, 40 | | |
| Presentation | 11 | <i>Instructions how to prepare presentation and major points that should be covered</i> | <i>In-class presentation model about Diclogesic® 50mg Diclofenac sodium EC tablet by the instructor</i> | 9,10,36 - 39 | | <i>In-class presentation model, Selected product leaflet, Laboratory Manual, General References provided below</i> |
| Emulsions: Preparation and Stabilization | 12 & 13 | <i>Two Videos** The first one about required reads and information and the second one about the experiment of the experiment</i> | Application of the experiment and Preparation of the final part of the portfolio | 6, 7, 8, 12, 15, 18, 23, 16, 17, 24-27, 33-35, 40 | Oral Discussion, Practical Session Weekly Evaluation, Portfolio construction (Reports & Data Analysis, Log-book), Pre-lab Assessment (Moodle-based quizzes), & Examinations | Laboratory Manual, General References provided below Videos |
| Final Examinations | 14 | | | | | |

*Each section instructor will be added at the beginning of each semester

**All videos were pictured and prepared; in the same practical session hall, using the same equipment, tools, and materials, by Suha Al Muhaisen, MSc. Each experiment video contains the practical part pictured inside the laboratory under the same settings that will be used by students, also, part of the video is about data analysis using Microsoft Excel tutorial. Moreover, the video may include, when needed, some theoretical information.

* Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting

* Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz...etc

21. Teaching/Learning Methods and Assignments:

| <i>Development of ILOs is promoted through the following teaching and learning methods:</i> | | | |
|---|--|--|----------------------------|
| ILO/s | Teaching and Learning Method/s | Evaluation Method/s | Assessment Method/s |
| 2, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 32 | Practical Sessions (Experiments), Lecturing, Oral Discussion | Student Weekly Evaluation*, Reports**, Portfolio**, Pre-lab quizzes, Examination | Rubrics* Rubric & Key** |
| 1, 3, 4, 19, 20 | Practical Sessions (Experiments), Lecturing, Reflections, Team working*, Assignment and Homework | Student Weekly Evaluation*, Reports**, Log-book**, Portfolio**, Pre-lab quizzes, Examination | Rubrics* Rubric & Key** |
| 13, 8, 21, 22, 23 | Practical Sessions (Experiments), Lecturing, Reflections, Team working*, Assignment and Homework | Student Weekly Evaluation*, Reports**, Log-book**, Portfolio**, Pre-lab quizzes, Examination | Rubrics* Rubric & Key** |
| 16, 17, 24, 25, 26, 27, 33, 34, 35 | Practical Sessions (Experiments), Oral Discussion, Reflections, Team working* | Homework & Assignment**, Reports**, Log-book**, Portfolio**, Pre-lab quizzes, Examination | Rubrics* Rubric & Key** |
| 28, 29, 30, 31, 36, 37, 38, 39 | Practical Sessions (Experiments), Oral Discussion, Reflections, Team working* | Reports**, Log-book**, Portfolio**, Pre-lab quizzes | Rubrics* Rubric & Key** |
| <p><i>* a special rubric is available to assess each of labelled/mentioned evaluation method.</i></p> <p><i>** a key with a rubric is available to assess</i></p> | | | |
| <p>Teaching methods</p> <ul style="list-style-type: none"> ✓ Blended Learning (part of the course is online material which is videos of the experiments) ✓ Practical Sessions (Experiments) ✓ Team-work Learning ✓ Lecturing ✓ Oral Discussions and brainstorming. ✓ Reflections. | | | |
| <p>Course Material and Announcements</p> <p>Course related announcements and examinations results will be posted on the <i>personal website of the instructor</i> and also <i>instructor E-learning website</i> and is responsibility of each student to check the site regularly.</p> | | | |
| <p>Learning Skills:</p> <ol style="list-style-type: none"> 1. Critical thinking 2. Digital literacy 3. Problem-solving skills 4. Self-directed learning 5. Scientific reasoning 6. Communication skills 7. Scientific writing 8. Team and group working 9. Leadership and team/group coordination | | | |

22. Evaluation Methods and Course Requirements:

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

| Evaluation Activity | Mark | Topic (s) | Period (Week)[§] | Platform |
|----------------------------|-------------|------------------------------------|---------------------------------------|-------------------------------------|
| Prelab Quizzes | 10 | Week Topic* | Every week (from week 2 till week 10) | Moodle (E-learning) |
| Presentation | 5 | Coated Tablets-selected brand name | Week 11 | In-School |
| Portfolio | 25 | Week Topic* | Weeks 3, 4, 5, 6, 7, 8, 9 & 11 | Moodle (E-learning) and Paper-based |
| Weekly Evaluation | 10 | Week Topic* | Every week (from week 2 till week 11) | Practical sessions |
| Midterm Examination | 20 | Cycle 1 | Week 8 | In-School |
| Final Examination | 30 | Course material | Week 13 | In-School |

[§]16-week semester

* As listed above

1. Pre-lab evaluation (online quizzes)
2. Presentation
3. Portfolio construction
4. Reports writing
5. Log-book preparation
6. Evaluation of skills during Practical sessions
7. Home works & Assignments
8. Discussion
9. Examinations

23. Course Policies:

A. Attendance Policies:

Attendance: Mandatory.

First Warning: after/with 1 absence

Second Warning: after/with 2 absence

Falling in the Subject/Course: after/with 3 absence

NB. University regulations applied.

B. Absences from exams and handing in assignments on time:

Will result in zero achievement unless health report or other significant excuse is documented.

C. Health and Safety Procedures:

General Laboratory Safety Instructions are maintained

D. Honesty Policy regarding cheating, plagiarism, misbehavior:

The participation, and/or the commitment of cheating will lead to applying all following penalties together:

1) Failing the subject, he/she cheated at

2) Failing the other subject taken in the same course

3) Not allowed to register for the next semester (summer semester is not considered as a semester).

NB. University regulations applied.

E. Grading Policy:

| | |
|---|-------------------|
| Portfolio | 25 points |
| Reports | |
| Log-Book | |
| Pre-Lab Assessment (BL related activities) | 15 points |
| Evaluation | 10 points |
| Midterm Examination | 20 points |
| Final Examination | 30 points |
| Total | 100 points |

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

- Laboratory Room.**
- Computers in Laboratory Rooms to enable data processing using Microsoft Excel®.**
- Internet access at different Computers Rooms.**
- Computers to prepare materials and printouts at different Computer Rooms.**
- Classrooms, internet, library (books, and electronics journals and books).**

24. Required Equipment:

- All equipment; devices. Tools, instruments, and glass-wares required to perform assigned experiments.**
- Data show/Screen and internet connection.**

25. References:

A. Required book(s), assigned readings, and audio-visuals.

- Laboratory Manual** (Practical Pharmaceutical Technology II Manual).
- USP Pharmacopeia** (Analysis and Enteric Coated Tablets Dissolution Official Testing).
- British Pharmacopeia** (Analysis and Enteric Coated Tablets Dissolution Official Testing).
- Videos for the used equipment and processes.**

B. Recommended books, materials, and media:

- ✓ **Pharmaceutics: The Science of Dosage Form Design** (M. E. Aulton, latest edition)
- ✓ **Pharmaceutical Dosage Forms: Parenteral Dosage Forms (1:3)** (Leiberman and Lachman, latest edition)
- ✓ **United States Pharmacopeia**
- ✓ **British Pharmacopeia**
- ✓ **Additional:**

Any suitable reference book is accepted.

Research and review articles are also used.

26. Additional information:

NA

Name of Course Coordinator: **Suha Al Muhaissen**

Signature: _____

Date: **Oct 8th, 2020**

Head of Curriculum Committee/Department: _____

Signature: _____

Head of Department: _____

Signature: _____

Head of Curriculum Committee/Faculty: _____

Signature: _____

Dean: _____

Signature: _____

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Assistant/Vice Dean for Quality Assurance
Course File