The University of Jordan

Faculty: Pharmacy
Department: Pharmaceutics and Pharmaceutical Technology
Program: BSc. In Pharmacy
Academic Year/Semester: 2013/2014 (Second semester)
Course Name (Course Number): Physicochemical Principles of Pharmacy (1202134)

<table>
<thead>
<tr>
<th>Credit hours</th>
<th>2</th>
<th>Level</th>
<th>1</th>
<th>Pre-requisite</th>
<th>0303101</th>
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</thead>
<tbody>
<tr>
<td>Coordinat or/ Lecturer</td>
<td>Office number</td>
<td></td>
<td>Office phone</td>
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<tr>
<td>Course website</td>
<td>E-mail</td>
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<td>Place</td>
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**Office hours**

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<tr>
<th>Day/Time</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
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**Course Description**

Study of the physicochemical properties of molecules incorporated in pharmaceutical preparations.

**Learning Objectives**

The student will be introduced to the physico-chemical characteristics of drugs and allied entities. In addition, the student will be provided with the knowledge and how to apply the fundamental physicochemical principles to the design, formulation, manufacture and evaluation of a wide range of dosage forms.
**Intended Learning Outcomes (ILOs):**
Successful completion of the course should lead to the following outcomes:

**A. Knowledge and Understanding:** Student is expected to

A.1. To understand the following basics of the physicochemical properties of drugs such as:
Intermolecular forces, States of matter (gas, liquid and solid). Phase equilibria and phase rule, Physical properties of drug molecules.

A.2. To understand the concept and factors affecting solubility and distribution phenomena.

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to

B.1. Conceptual understanding that enables the student to evaluate critically the principles physical pharmacy all aspects of scientific activities and theories intended to be applied in aspects related to characterization, preparation and understanding of drug formulation.

B.2. Have an ability to deal with complex issues both systematically and creatively, and to assemble, assimilate and analyze critically a range of information including both scientific data and library-based.

**C. Subject-Specific Skills:** Student is expected to have:

C.1. A systematic understanding of knowledge to interpret and evaluate information related to the physicochemical characteristics of drugs.

C.2. A comprehensive ability to differentiate between properties of solutions of electrolytes and nonelectrolytes.

**D. Transferable Key Skills:** Students is expected to

D.1. The ability to work effectively both in an independent manner through self-direction in planning and implementing tasks, and also as a member of a team following discussion and agreement of procedures.

D.2. The ability to disseminate information effectively both orally and in written form both to specialist and non-specialist audiences.
D.3. The independent learning ability required for continuing professional development.

**ILOs: Learning and Evaluation Methods**

<table>
<thead>
<tr>
<th>ILO/s</th>
<th>Learning Methods</th>
<th>Evaluation Methods</th>
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<tbody>
<tr>
<td></td>
<td>Lectures and Discussions, Homework and Assignments, Projects, Presentation, …</td>
<td>Exam, Quiz, assignments.</td>
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**Course Contents**

<table>
<thead>
<tr>
<th>Content</th>
<th>Reference*</th>
<th>Week</th>
<th>ILO/s**</th>
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<tbody>
<tr>
<td><strong>Intermolecular forces.</strong> Ionic bond, coordinate bond, covalent bond, hydrogen bond and van der waal forces.</td>
<td>1 and 2</td>
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</table>
| **States of matter.**  
- Gas state: definition, properties, Ideal gas law, Real gas behaviors and law.  
- Liquid state: definition, properties, vapor pressure, boiling point.  
- Pharmaceutical aerosols: liquefied gas aerosols and compressed gas aerosols.  
- Solid state: Definition and properties, arrangement of drug molecules in the solid state (amorphous form, crystalline form and polymorphism) and its effect on melting, solubility and dissolution. Studying of solid | 3-5 | |
state using differential scanning calorimetry (DSC).

**Phase equilibria and phase rule.**
Liquid-liquid binary mixtures, liquid-liquid ternary mixture, solid-solid binary mixtures.

6 and 7

**Mid Exam**

**Physical properties of drug molecules.**
Dielectric constant, Dipole moment, Polarization, Refractive index.

8

**Solutions of nonelectrolytes.**
Properties of solutions, concentration expressions, equivalent weights, ideal solutions, real solutions, colligative properties, molecular weight determination.

9

**Solutions of electrolytes.**
Electrical conductance, equivalent conductance, colligative properties of electrolytes, Arrhenius theory of electrolytic dissociation, theory of strong electrolytes, the ionic strength, the Debye-Huckle theory, osmotic coefficient, osmolality and osmolarity.

10 and 11

**Isotonic solutions.**
Measurement of tonicity, calculating tonicity using Liso value, methods of adjusting tonicity.

12 and 13

**Solubility and Distribution.**

14

15 and 16
Solvent-Solute interaction, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, solubility improvement, distribution of solutes between two immiscible solvents.

*Mentioned below.
**Mentioned above.

**Evaluation**

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<thead>
<tr>
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<th>Point %</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
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<td>8th week</td>
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<td>Assignments</td>
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<td>4th week</td>
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<tr>
<td>Quiz</td>
<td>10</td>
<td>10th week</td>
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<tr>
<td>Final Exam</td>
<td>50</td>
<td>17th week</td>
</tr>
</tbody>
</table>

**Main Reference/s:**

- Martin’s Physical Pharmacy and Pharmaceutical Sciences. 6th Edition. 2011. Published by Lippincott Williams & Wilkins, USA.
  
  [http://thepoint.lww.com/Sinko6e](http://thepoint.lww.com/Sinko6e)

- Martin’s Physical Pharmacy and Pharmaceutical Sciences. 5th Edition. 2006. Published by Lippincott Williams & Wilkins, USA.

- Physical Pharmacy, Physical Chemical Sciences, A.Martin et al., 4th Edition. 1993. Published by Lea and Febiger, USA.
Other references:
Some Basic Reading References:

- Physicochemical Principles of Pharmacy by A.T. Florence and D. Attwood. 4\textsuperscript{th} Edition.
  2005. Published by Pharmaceutical Press, UK.
- Pharmaceutics, The Science of Dosage Form Design by M.E. Aulton. 2\textsuperscript{nd} Edition.
  2002. Published by Churchill Livingstone, USA.
  2006. Published by Lippincott Williams & Wilkins, USA.
  Published by EI, BS.UK.