

## Planning and Quality Assurance Affairs

Form (A)

### Course Specifications

#### General Information

|                                   |                     |
|-----------------------------------|---------------------|
| <b>Course name</b>                | Physical Pharmacy 1 |
| <b>Course number</b>              | PHTC1201            |
| <b>Faculty</b>                    |                     |
| <b>Department</b>                 |                     |
| <b>Course type</b>                | Major Needs         |
| <b>Course level</b>               | 1                   |
| <b>Credit hours (theoretical)</b> | 2                   |
| <b>Credit hours (practical)</b>   | 0                   |
| <b>Course Prerequisites</b>       |                     |

#### Course Objectives

- 1 - To recognize the area of pharmacy that deals with the quantitative and theoretic principles of science as they apply to the practice of pharmacy.
- 2 - To aid the pharmacist, pharmacologist, and the pharmaceutical chemist in their attempt to predict the solubility, stability, compatibility, and biologic action of drug products.
- 3 - To be in a better position to develop new drugs and dosage forms and to improve upon the various modes of administration.
- 4 - To be able to use the physico chemical principles in various branches of pharmacy.
- 5 - To help students, researchers and manufacturing pharmacists to use the elements of mathematics, chemistry, and physics in their work and study.
- 6 - To recognize the responsibilities and duties of the pharmaceutical department.
- 7 - To be able to conduct preformulation studies in the pharmaceutical units.
- 8 - To recognize the problems encountered during the manufacturing of pharmaceutical dosage forms.

## Intended Learning Outcomes

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Knowledge and Understanding</b> | <ul style="list-style-type: none"><li>* To be able to deal with the duties of the pharmaceutical department: research and development department, quality control department, and quality assurance department.</li><li>* To have the ability to conduct preformulation studies, such as accelerated stability studies and compatibility studies.</li><li>* To know various problems encountered during the manufacturing of the pharmaceutical dosage forms, and the possible remedies for each problem.</li><li>* To be able to perform quality control tests for the pharmaceutical dosage forms.</li></ul> |
| <b>Intellectual Skills</b>         | <ul style="list-style-type: none"><li>* To be able to analyze and present the data obtained from the different pharmaceutical units.</li><li>* To be able to suggest remedies for the problems encountered during the manufacturing and formulation of pharmaceutical dosage forms.</li></ul>                                                                                                                                                                                                                                                                                                                  |
| <b>Professional Skills</b>         | <ul style="list-style-type: none"><li>* To gain knowledge and analytical skills to work with people in the pharmaceutical units.</li><li>* To have the ability for quick adaptation to the working environment in pharmaceutical units.</li><li>* To have the ability to deal with and suggest solutions to the problems encountered during the manufacturing process of pharmaceutical dosage forms in the pharmaceutical units.</li></ul>                                                                                                                                                                    |

## Course Contents

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| 1 - Introduction: dimensions and units, some elements of mathematics.                                                                                                                                                                                               |
| 2 - Intermolecular forces and states of matter: binding forces between molecules, states of matter; the gaseous state, the liquid state, solid and crystalline state, polymorphism, amorphous solids, the liquid crystalline state, phase equilibria and phase rule |
| 3 - Physical properties of drug molecules: dielectric constant, induced polarization, dipole moment, refractive index, molar refraction and optical rotation                                                                                                        |
| 4 - Solutions of nonelectrolytes: concentration expression, ideal and real solutions, colligative properties and molecular weight determination                                                                                                                     |
| 5 - Solutions of electrolytes: properties of solution of electrolytes, Arrhenius theory of electrolytic dissociation, theory of strong electrolytes, coefficients for expressing colligative properties, Debye and Hückle theory                                    |
| 6 - Isotonic solutions: isotonic solutions and methods of adjusting tonicity                                                                                                                                                                                        |
| 7 - Solubility and distribution phenomena: general principles, solvent-solute interactions, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, distribution of solutes between immiscible solvents                  |
| 8 - Some solvents used in liquid dosage forms; ethanol, glycerin, propylene glycol, purified water, types of pharmaceutical water. Oral solutions, syrups, elixirs, aromatic waters, spirits, tinctures, extracts, liniments, and collodions                        |

## Teaching and Learning Methods

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|-----------------------------------------------|
| 1 - Lectures.                                 |
| 2 - Assignments for self analytical learning. |

## Students Assessment

| <b><u>Assessment Method</u></b> | <b><u>TIME</u></b>                  | <b><u>MARKS</u></b> |
|---------------------------------|-------------------------------------|---------------------|
| Midterm Exam                    | Approximately during the 8th week.  | 30%-40%             |
| Final Exam                      | Approximately during the 14th week. | 60%                 |
| Homework                        | During the course time              | 10%                 |
| Quizzes                         | During the course time              | 10%                 |

## Books and References

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|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Essential books                                           | Martin, A., Bustamante, P. and Chun, A.H.C. 1993. Physical Pharmacy. Physical Chemical Principles in the Pharmaceutical Sciences. Fourth edition. Lea and Febiger. Philadelphia, London.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Recommended books                                         | <p>Ansel Jr., Loyd V., Popovich, Nicholas G. and Ansel, Howard C. 2011. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. Ninth edition. Lippincott Williams &amp; Wilkins. Philadelphia. USA.</p> <p>Ansel, H.C., Popovich, N.G. and Allen, L.V. Jr. 1995. Pharmaceutical Dosage Forms and Drug Delivery Systems. Sixth edition. Lea and Febiger, USA.</p> <p>Attwood, D. and Florence, T.A. 1983. Surfactant Systems, Their Chemistry, Pharmacy and Biology. First edition. Chapman and Hall. London, New York.</p> <p>Aulton, E.M. 1990. Pharmaceutics. The Science of Dosage Form Design. Second edition. ELBS, UK.</p> <p>Aulton, Michael E. 2007. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. Third edition. A Churchill Livingstone, Elsevier limited.</p> <p>Brady, J.E. and Humiston, G.E. 1980. General Chemistry. Principles and Structure. Second edition. Hohn Wiley &amp; Sons Inc. USA.</p> <p>Florance, A.T. and Attwood, D. 1985, Physicochemical Principles in Pharmacy. Second edition. Macmillan,UK.</p> <p>Lechman, L., Libberman, H.A., and Kanig, J.L. 1986. The Theory and Practice of Industrial Pharmacy. Third edition. Lea and Febiger, Philadelphia, USA.</p> <p>Libberman, H.A. and Lechman, L. 1981. Pharmaceutical Dosage Forms. Second edition. Marcel Dekker. Inc., N.Y., USA.</p> <p>Sinko, Patrick J. 2010. Martin's Physical Pharmacy and Pharmaceutical Sciences. Sixth edition. Lippincott Williams &amp; Wilkins. Philadelphia. USA.</p> <p>Sinko, P.J. and Singh, Y. 2011. Martin's Physical Pharmacy and Pharmaceutical Sciences. Physical Chemical and Biopharmaceutical Principles in the Pharmaceutical Sciences. Sixth edition. Wolters Kluwer- Lippincott Williams &amp; Wilkins. USA.</p> <p>Troy, David B. 2005. Remington – The Science and Practice of Pharmacy. Twenty first edition. Lippincott Williams &amp; Wilkins. Philadelphia. USA.</p> <p>Yalkowsky, S.H., Sinkula, A.A. and Valvani S.C. 1980. Physical Chemical Properties of Drugs. Marcel Dekker, INC, USA.</p> |
| Other References<br>(Periodical, web sites,<br>.... etc.) | <p>Rowe, Raymond C., Sheskey Paul J. and Quinn Marian E. 2009. Handbook of Pharmaceutical Excipients. Sixth edition. Pharmaceutical Press and American Pharmacists Association. London, UK and Washington USA. Available online at the link:<br/> <a href="https://nurirjawati.files.wordpress.com/2012/01/handbook-of-pharmaceutical-excipients-6th-edition.pdf">https://nurirjawati.files.wordpress.com/2012/01/handbook-of-pharmaceutical-excipients-6th-edition.pdf</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |