Course specifications of Instrumental chemistry (III)

Benghazi University
Faculty: Pharmacy
Department: Pharmaceutical chemistry
Course title: Instrumental Chemistry

Course Specifications

Program on which the course is given: Bachelor of Pharmaceutical Science
Academic year / level: Third year
Date of course specification approval: 2015/2016

1. Basic Information:

Tile: Instrumental Chemistry **Code**: P301 **Credit hours**: 4hrs
Lecture: Theory 2hrs Tutorial: 1hrs Practical: 3hrs
Practical: 3hrs Total: 5 hours/week

2. Course Objectives:

The aim of the course is to provide students with the bases of the different methods of instrumental analysis, the various separation techniques, instrumentation and application of GLC, HPLC.

3. Intended Learning Outcomes (ILOs):

a. Knowledge and understanding:

b. Intellectual Skills:

a1 The use of absorption of (light, heat energy) or emission of energy by chemical substances for their qualitative & quantitative analysis.

a2 Absorption spectrophotometry, fluorimetry , flame spectroscopy , flame emission & atomic absorption.

a3- Electrochemical techniques, like conductometry and potentiometry.

a4. Theoretical basis of separation techniques (chromatography): GLC & HPLC.

b1 Analyze pharmaceutical chemical substances.

b2- Select the most suitable method of analysis.

b3 Develop and improve analytical methods to prevent interferences.

c. Professional and Practical Skills:

By the end of the course, the student should be able to work with minimum guidance in laboratories dealing with quality control in pharmaceutical industries, environmental pollution.

d. General and Transferable Skills:

Student should be able to work independently our as a time in different quality control labs.

No.	Topic	No. of hrs	Lecturer
1.	**Spectrophotometry:** ➢ Nature of light, electronic transition in molecules due to interaction with light, laws governing quantitative analysis ➢ (Beer-Lamberts law) Instrumentation, colorimetry (standard series method & balancing methods. ➢ Quantitative determination of single component, multicomponent, impurities and Ka of weak acid.	12	
2.	**Infrared spectroscopy:** ➢ Introduction, principle, theory, modes of vibrations, applications, instrument and IR limitations and properties	4	
3.	**Emission spectroscopy (Fluorimetry):** ➢ Theory of fluorescence, phosphorescence, different relaxation processes, factors affecting fluorescence, quantitative fluorescence, instrumentation and applications.	3	
4.	**Flame spectroscopy (Photometry):** ➢ **A) Flame emission:** I. Classification of Flame Spectroscopic Methods. II.Flame Spectra: Flame emission (Theory & instrumentation, principle, limitation of Flame Emission Photometry, interferences, quantitative measurements and applications). ➢ **B) Atomic absorption:** (Theory, principle, instrumentation, quantitative measurements and applications)	5	
5.	**Separation techniques (By chromatography):** ➢ Introduction, theoretical bases and terms. ➢ Classifications of chromatographic techniques. ➢ Mechanisms of chromatographic separation. ➢ Chromatogram. ➢ Terms used in chromatography with calculations. ➢ The plate theory. ➢ Band broadening and factors affecting it . ➢ Optimization of column performance. ➢ Types of elution. ➢ Requirement of solvents used as mobile phase. ➢ Choice of chromatographic separation methods **Gas Chromatography (GC):** Types of GC, principle, types of samples for GC, derivatization in GC, advantages and dis advantages, qualitative and quantitative analysis and application. **High Performance Liquid Chromatography (HPLC):** (Introduction. Principle, types of sample, advantages and dis advantages, qualitative and quantitative analysis and application.	6	

4. A. Theoretical Contents:

No.	Topic	No. of hrs	Lecturer
6.	**Potentiometry:** ➢ Introduction, Electrochemical cells, indicator electrodes, reference electrodes and applications.	6	
7.	**Conductometry:** ➢ Introduction and factors affecting conductance of electricity, conductance cell and applications.	2	
8.	**Polarography:** ➢ Introduction, Dropping Mercury Electrode (DME), instrument, principle, diffusion current, Ilkovic equation, advantages and disadvantages of DME and applications.	6	
	Total No. of hrs	**44 hrs**	

4. B. Practical contents

Week No.	Topic
1.	General policies & Safety precautions
1.	Fundamental terms
2.	Introduction to spectrophotometry
2. 4.	Colorimetric determination of Iron (III) with thiocyanate Part one: Lambda max determination Part Two: Unknown concentration determination using calibration cure method.
6. 8.	Colorimetric Determination of Copper (II) with Ammonia Part one: Lambda max determination and Unknown concentration determination using comparison method. Part Two: Unknown concentration determination using calibration cure method and standard addition method.
10.	Spectrophotometric Determination of Nitrite
12.	Introduction to potentiometry
14.	Potentiometric Titration of strong acid against strong base (Determination of concentration of HCl by titration with NaOH)
16.	Part Two: Potentiometric Titration of weak acid against strong base (Determination of concentration of CH_3COOH by titration with NaOH)
18.	Titration of polybasic acid against strong base (Determination of concentration of H_3PO_4 by titration with NaOH)

5.Teaching and Learning Methods:

(All methods below can be used)

5.1. Lectures using white board
5.2. Data show
5.3. Power point presentation
5.4. Tutorial Discussion
5.5. Lab Discussion

6. Student Assessment Methods:

Assessment methods:

1- Quizzes (ongoing evaluations) to assess Student's knowledge and understanding

2- Final Theoretical Evaluation to assess overall performance of the students.

3- Lab Reports (ongoing evaluations) to assess general skills of the student.

c) Weighing of Assessments:

Assessment (Quizzes) Examination	40 marks / 200
Final Examination	120 marks/200
Practical Examination	40 marks /200
Other types of assessment	----------
Total	200 Marks 100%

7- List of References:

No.	Reference	Type
1.	Fundamentals of analytical chemistry,D.A.Skoog,2004,8th.ed.Brookkole pub.	**textbook**
2.	Quantitative analysis ,V.alexyeyev,2004,CBSpub.	**periodical**
3.	Undergratuate instrumental analysis, J.W. Robinson,2005 6th.ed,marcel dekker.	**website**
4	**Vogel`s textbook of quantitative inorganic analysis (1978)Vogel, A Basset, longmann**	**Textbook**

Course Coordinator: Dr. Seham Shaboun El Sharkasi

Head of Department: Dr. Ruwida El Snini

Edited on 2018-2019