Department	Pharmacy

Course Name	Instrumental Analysis	Course No.	0201311
Prerequisite	Pharmaceutical Analytical Chemistry	Credit Hours	2
Number & date of course plan approval	2013-2014	Brief Description	See form QF02/0409

Intended Learning Outcomes	1- At the end of this course the student is expected to have acquired basic knowledge regarding the importance of analysis in pharmaceutical industry and the principles for different instrumental methods of analysis including electrochemical (potentiometry and conductimetry), spectroscopic (UV/ Vis., fluorometry, atomic spectroscopy, IR and NMR) and chromatographic methods (HPLC and GC). 2- The aims of this course include the ability of the student to employ the knowledge he would acquire through the course to design, develop and criticize analytical methods that are based on the principles taught in the course.		
Course Topics	1- Electrochemistry 2- Spectroscopic techniques 3- Structural Elucidation 4- Chromatography		
Text Books	1- Pharmaceutical Analysis: A Textbook for Pharmacy Students and Pharmaceutical Chemists, 3rd edition, David Watson, Elsevier/ Churchill Livingstone, 2012.		
References	1- Spectroscopic Methods in Organic Chemistry, 6th edition, Dudley Williams, Ian Fleming, McGraw-Hill book company, 1995 2- Organic Structures from Spectra, 3rd edition, L. D. Field, S. Sternhell and J. R. Kalman, John Wiley & Sons, 2002. 3- Spectrometric Identification of Organic Compounds, 7th edition, Robert M. Silverstein, Francis X. Webster and David Kiemle, John Wiley & Sons, 2005. 4- Principles of Instrumental Analysis, 6th edition, Skoog, D. A., Brooks/ Cole Thomson Learning, 2007.		
Grade Determination	1st Exam = 25% 2nd Exam = 25% Final Exam = 50%	Practical Course Grade Determination	Course Work = 50% (Reports, Term Papers, Quizes) Final Exam = 50%

Course Outline

Week	Hours	Subjects	Chapters in Textbook	Notes
1	2	- Review of the concept of pharmaceutical analysis in pharmaceutical industry and pharmacopoeal specifications of a pharmaceutical product. - Criteria of reliable analytical methods.	Introduction	
2	2	- Basic concepts of electrochemistry i.e. how potential difference is developed across a membrane. - Electrochemical cell and cell potential. - Types of electrodes, ion selective electrodes, membrane electrodes, silver electrode, calomel electrode, glass electrode.	Electrochemistry	
3	2	- pH measurement. - Applications of electrochemistry e.g. potentiometric titration of acids and bases. - Other methods involving electrochemistry (Conductimetry).	Electrochemistry	
4	2	- Basic concepts of light (spectrum and electromagnetic radiation) and interaction with matter, theory of excitation and structural requirements for light absorption. - Basic design of UV/ Vis. spectroscopy. - Beer's Lambert law.	Ultraviolet- Visible Spectroscopy	
5	2	- Quantitative applications of Beer's Lambert law and its use in analysis. - Important considerations in using UV/ Vis. spectroscopy e.g. potential deviations from linearity and how to diagnose and resolve the problem. - Effect of solvents and pH on spectra.	Ultraviolet- Visible Spectroscopy	
6	2	- Potential effects of different instrumental factors like stray light and chemical factors like the nature of the sample being measured. - Quantitative and qualitative uses of UV/ Vis. e.g. determination of drugs in a mixture.	Ultraviolet- Visible Spectroscopy	
7	2	- Fluorescence and phosphorescence origin, excited and ground state. - Effect of structure, temperature and solvent. - Basic design of a spectrofluorometer. - Applications.	Luminescence Molecular Spectroscopy	

Week	Hours	Subjects	Chapters in Textbook	Notes
8	2	- Basic theory of atomic excitation. - Analytical applications. - Instrumentation, advantages and disadvantages of each technique.	Atomic emission and Atomic absorption Spectroscopy	
9	2	- Origin of IR band, modes of vibrations, uses of IR for identification and elucidation of compounds.	Infra Red Spectroscopy (IR)	
10	2	- Basic designs of the instrument and practical handling of the sample.	Infra Red Spectroscopy (IR)	
11	2	- The origin of resonance, spin- spin coupling. - The concept of chemical shift, instrumentation and sample handling.	NMR Spectroscopy	
12	2	- ^{13}C NMR and ^{1}H NMR. - Applications and examples on NMR.	NMR Spectroscopy	
13	2	- Mass spectrometer, mass spectrum, fragmentation. - Application examples.	Mass Spectroscopy	
14	2	Combined structure problems: 1.UV spec. 2. IR spec. 3.Mass spec. 4. ^{1}H and ^{13}C NMR	Structural Elucidation	
15	2	- Theory of chromatography, chromatogram, and parameters of chromatography e.g. retention time, peak width, resolution etc...	Chromatographic Techniques	
16	2	- Instrumentation of HPLC, modes of HPLC: normal phase and reversed phase. - Factors affecting retention on either mode. - Analytical applications of HPLC and GC.	Chromatographic Techniques	

Approved by Dept. Chair		Date of Approval	

Extra Information: (Updated every semester and filled by course instructor)

Course Instructor	
Office No.	
Extension **Email**	
Office hours	