Program	Bachelor of Pharmacy (BPharm)	**Semester - 4**
Type of Course	-	
Prerequisite		
Course Objective	-	
Effective From A.Y.	2023-24	

Teaching Scheme (Contact Hours)				Examination Scheme				
				Theory Marks		Practical Marks		
Lecture	Tutorial	Lab	Credit	External Marks (T)	Internal Marks (T)	External Marks (P)	Internal Marks (P)	Total Marks
3	1	4	6	75	25	35	15	150

SEE *- Semester End Examination,* ***CIA*** *- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)*

Course Content

T - Teaching Hours | **W** - Weightage

Sr.	Topics	T	W
1	**UNIT-I** 1. Pharmaceutical Analysis- Definition and Scope 2. Different Techniques of Analysis 3. Methods of Expressing Concentration 4. Primary and Secondary Standards 5. Preparation and Standardization of various molar and normal solutions- oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate 6. Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures 7. Pharmacopoeia, Sources of Impurities in medicinal agents, Limit Tests	10	23
2	**UNIT-II** 8. Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves 9. Non aqueous titration: Solvents, Acidimetry and Alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl	10	23
3	**UNIT-III** 10. Precipitation Titration: Mohr's Method, Volhard's, Modified Volhard's, Fajans Method, Estimation of Sodium Chloride 11. Complexometric Titration: Classification, Metal ion Indicators, Masking and Demasking reagents, Estimation of Magnesium Sulphate and Calcium Gluconate 12. Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: coprecipitation and post precipitation, Estimation of Barium Sulphate 13. Basic Principles, methods and application of Diazotisation Titration	10	23
4	**UNIT-IV** 14. Redox Titration a. Concepts of oxidation and reduction b. Types of redox titrations (Principles and applications) 15. Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with Potassium Iodate	8	16
5	**UNIT-V** 16. Electrochemical Methods of Analysis 17. Conductometry- Introduction, Conductivity cell, Conductometric Titration, Applications 18. Potentiometry - Electrochemical Cell, Construction and Working of Reference (Standard hydrogen, silver chloride electrode and calomel electrode) and Indicator Electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications 19. Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, application	7	15
	Total	**45**	**100**

Suggested Distribution Of Theory Marks Using Bloom's Taxonomy

Level	Remembrance	Understanding	Application	Analyze	Evaluate	Create
Weightage	30	30	20	10	5	5

NOTE : This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes

At the end of this course, students will be able to:	
CO1	Understanding the basic concepts of analytical techniques; Knowledge of limit tests & its application; and errors in pharmaceutical analysis
CO2	Knowledge of principles, theory, methods and applications of various titrimetric methods of analysis
CO3	Knowledge of principles, theory, methods and applications of gravimetry
CO4	Knowledge of principles, theory, methods and applications of various electrochemical methods of analysis
CO5	Ability to carry out assay of various compounds by using various titrimetric and electrochemical methods of analysis

Reference Books

1.	**Practical Pharmaceutical Chemistry** By A. H. Beckett and J. B. Stenlake | 2005 | 4
2.	**Text Book of Quantitative Inorganic analysis (TextBook)** By A.I. Vogel
3.	**Inorganic pharmaceutical chemistry** By P. Gundu Rao
4.	**Textbook of Pharmaceutical Chemistry (TextBook)** By Bentley and Driver
5.	**Analytical Chemistry Principles** By John H. Kennedy
6.	**Indian Pharmacopoeia**

List of Practical

1.	To calibrate volumetric apparatus
2.	To prepare and standardize 0.1 N NaOH
3.	To prepare and standardize 0.1 N HCl
4.	To prepare and standardize 0.1 N sulphuric acid
5.	To prepare and standardize 0.05 M sodium thiosulphate
6.	To prepare and standardize 0.1 N potassium permanganate
7.	To carry out assay of ammonium chloride by acid base titration
8.	To carry out assay of copper sulphate using sodium thiosulphate by Iodometric titration
9.	To carry out assay of hydrogen peroxide using 0.1N potassium permanganate by permanganometric titration
10.	To determine %w/v of NaCl in a given sample by Mohr's method
11.	To carry out assay of calcium gluconate using Disodium EDTA by Complexometric titration
12.	To determine end point of titration of strong acid (HCl) and strong base (NaOH) by Conductometric titration
13.	To determine end point of titration of weak acid (acetic acid) and strong base (NaOH) by Conductometric titration
14.	To determine end point of titration of titration of HCl with NaOH using potentiometer and to determine normality of HCl
15.	To carry out assay of NaCl by Fajan's method

List of Tutorial

1.	Tutorial 1
2.	Tutorial 2
3.	Tutorial 3
4.	Tutorial 4
5.	Tutorial 5
6.	Tutorial 6
7.	Tutorial 7
8.	Tutorial 8
9.	Tutorial 9
10.	Tutorial 10
11.	Tutorial 11
12.	Tutorial 12
13.	Tutorial 13
14.	Tutorial 14
15.	Tutorial 15