Name of Faculty	:	Faculty of Science
Name of Program	:	Master of Science
Course Code	:	1MSO06
Course Title	:	Physical Chemistry and Analytical Chemistry Practical –II
Type of Course	:	Basic Science
Year of Introduction	:	2023-24

Prerequisite	:	Know instrumentation of various basic physical and analytical techniques.
Course Objective	:	It develops essential laboratory skills required for safe handling of chemicals, to prepare standard solutions, and learns the use of SOP' to operate routine laboratory equipment.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Understanding and create good laboratory practices and safety.
	CO2	To analyze of complex material by various instrumental methods
	CO3	Remember the concepts learnt about conductometric titrations and acids base titrations.
	CO4	To adopt knowledge of laboratory techniques
	CO5	Understand the standardization of instruments like pH meter, Conductometer and Potentiometer.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			**Credits**	**Examination Marks**				
				Theory Marks		**Practical Marks**		**Total Marks**
L	**T**	**P**	**C**	**SEE**	**CIA**	**SEE**	**CIA**	
0	0	8	4	-	-	70	30	100

Legends: ***L****-Lecture;* ***T****–Tutorial/Teacher Guided Theory Practice;* ***P*** *– Practical,* ***C*** *– Credit,* ***SEE*** *– Semester End Examination,* ***CIA*** *- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)*

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	**20**	**40**	**20**	**20**	**-**	**-**

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.

Suggested List of Experiments / Tutorials

Sr. No.	Name of Experiment/Tutorial	Teaching Hours	Mapping With COs
	A. Physical Chemistry Practical:		
	I Conductometry		
1	Titration of mixture of strong acid and weak acid with strong base (HCl + HAC against NaOH)	04	CO2 CO3 CO5
2	Titration of mixture of strong acid and weak acid with weak base (HCl + HAC against NH_4OH)	04	
3	Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH and find the strength of the acids in mixture.	04	
4	Titration of mixture of strong (HCl) and weak (HAC) acid with NH4OH and find the strength of the acids in mixture.	04	
5	Solubility product of sparingly soluble salts – $PbSO_4$ & $BaSO_4$	04	
	II Potentiometry		
1	Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH / NH4OH and find the strength of the acids in mixture.	04	CO2 CO5
2	Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH / NH4OH and find the strength of the acids in mixture.	04	
	II pH metry		
1	Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH and find the strength of the acids.	04	CO2 CO5
2	Titration of mixture of strong (HCl) and weak (HAC) acid with NH_4OH and find the strength of the acids.	04	
3	Titration of mixture of bases (Na_2CO_3 & $NaHCO_3$) with standard HCl and find the concentration of bases.	04	
1	**IV Adsorption and kinetics** 1. Hydrolysis of esters	04	CO1
2	2. Reaction between K2S2O8 and KI. (a=b)	04	
3	3. Reaction between K2S2O8 and KI. (a≠b)	04	
1	**V Distribution method** 1. Distribution of acetic acid between H2O and butanol.	04	CO1 CO4
2	2. Distribution of HAC between H2O and $CHCl_3$ / CCl_4	04	
3	3. Distribution of I2 between H_2O and CCl_4	04	
	B. Analytical Chemistry Practical:		
1	Calibration of glass wares and balance.	04	CO1
2	Calibration of pH meter, conductometer and potentiometer.	04	CO1 CO2

			CO3
3	Preparation of stock solution and standardization [HCl, NaOH and KHP]	04	CO1 CO4
4	Determination of chloride in water sample.	04	CO1
5	Determination of vitamin C in orange juice/amla.	04	CO1
6	Determination of acetic acid in vinegar.	04	CO1
7	Determination of total dissolved solids in water samples.	04	CO1 CO4
8	Determination of ascorbic acid in vitamin C tablets.	04	CO1
9	Determination of calcium and magnesium in water sample.	04	CO1 CO4
10	Determination of sodium carbonate and sodium bicarbonate in washing soda.	04	CO1 CO4
11	Determination of sulphate in water sample.	04	CO1
12	Determination of available chlorine in bleaching powder.	04	CO1

Major Equipment / Instruments and Software Required

Sr. No.	Name of Major Equipment / Instruments and Software
1	Conductometer
2	Potentiometer
3	pH meter
4	reagent bottles
5	Funnel
6	Beaker
7	Burette
8	Pipette
9	Burette
10	conical flask
11	Weighing Balance

Suggested Learning Websites

Sr. No.	Name of Website
1	5: pH Measurement and Its Applications (Experiment) - Chemistry LibreTexts
2	The potentiometer- Comparison of emf (Simulator) : Class 12 : Physics : Amrita Online Lab (olabs.edu.in)

Reference Books

Sr. No.	Name of Reference Books
1	Experimental physical chemistry – R. C. Das, B. Behera
2	Practicals in physical chemistry – P.S. Sindhu
3	Practical physical chemistry –J. B. Yadav
4	Experiments in physical chemistry- P. H. Parsania, F. Karia

5	Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.
6	Analytical Chemistry Practice, John H. Kennedy, Saunders College Publishing, Second Edition 1990.
7	Quantitative Chemical Analysis, by Daniel C. Harris, 5th Edition, W.H. Freeman and Company, New York.
8	Analytical Chemistry, by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.