



University of Kerala

Discipline	CHEMISTRY				
Course Code	UK4SECHE201				
Course Title	PRACTICAL SKILLS IN CHEMISTRY				
Type of Course	SEC				
Semester	4				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4
Pre-requisites	Basic knowledge, practical skills and interest in chemistry				
Course Summary	The course covers lab safety measures, preparation of standard solutions, measurement of pH of different samples, volumetric analysis and salt analysis.				

Detailed Syllabus:

Module	Unit	Content	Hrs
		PRACTICAL SKILLS IN CHEMISTRY	60
I		LAB SAFETY	6
	1	Risk, Hazard, Chemical Hazard, Symbols, Incompatible chemicals,	1
	2	Storage and handling of chemicals, handling of acids, ethers, toxic and poisonous chemicals, antidotes.	2
	3	Fire Classification, Occupational, Health and Safety Administration,	1
	4	Personal Protective Equipment (PPE). First aid procedure,	1
	5	Safety protocols and procedures.	1
II		PREPARATION OF STANDARD SOLUTIONS	6
	6	Concentration terms: Molarity, molality, normality, mole fraction, weight percentage, ppm, (Simple numerical problems).	2
	7	Primary and secondary standards, criteria for primary standards,	1
	8	Preparation of standard solutions	1
	9	Preparation of decinormal solutions - sodium carbonate and oxalic acid solutions.	2
III		MEASUREMENT OF pH	6
	10	pH -definition, equation, pH scale, (simple numerical problems)	1
	11	Determination of pH of different samples using pH paper, universal indicator and pH meter.	2
	12	pH –fruits, vegetables, Milk, water, soap.	2
	13	Natural indicator – preparation.	1



IV	BASIC CONCEPTS OF QUANTITATIVE & QUALITATIVE ANALYSIS		12
	14	Introduction to titration – Titration, titrant, titrate, acid- base indicator, endpoint, and equivalence point.	1
	15	Principle of titration, standardization of solutions	1
	16	Estimation of NaOH, HCl, Na ₂ CO ₃ , Oxalic acid, Permanganometric titrations.	4
	17	Introduction to anions and cations, common ion effect, solubility product	2
	18	Identification – ammonium chloride, barium carbonate, zinc nitrate, aluminium sulphate and lead acetate.	4
V	PRACTICALS		18
	A	Section A (4 experiments are compulsory from section A)	
	1	Preparation of decinormal solutions of Na ₂ CO ₃ , Oxalic acid, Sodium oxalate, Mohr's salt and Potassium dichromate	
	2	Standardisation of HCl, NaOH, KMnO ₄ using AR crystals.	
	3	Qualitative identification of any two cations and anions.	
	4	Determination of pH of water by potentiometric method.	
	5	Determination of pH of 5 fruit and vegetable juice each.	
	B	OPEN ENDED ACTIVITIES:	12
		lab safety orientation sessions for common laboratory hazards, safety equipment emergency procedures – identification of potential hazards and suggestions improvements in the lab, safety topics relevant to their field of study, hands-on sessions to practice of preparing standard solutions, designing experiments to estimate particular solutions of acid/base/reducing agent/oxidizing agent, hands on sessions with pH meters or pH indicators of aqueous solutions with unknown pH values etc (Or any other related activities introduced by the teacher)	

REFERENCES:

1. V.V. Ramanujam, *Inorganic Semi Micro Qualitative Analysis*, 3rd edition, the National Publishing Company, Chennai, 1974.
2. *Vogel's Text Book of Inorganic Qualitative Analysis*, 4th edition, ELBS, London, 1974.
3. D.A. Skoog, D.M. West and F.J. Holler, *Analytical Chemistry: An Introduction*, 5th edition, Saunders college publishing, Philadelphia, 1990.
4. U.N. Dash, *Analytical Chemistry: Theory and Practice*, Sultan Chand and sons Educational Publishers, New Delhi, 1995.
5. R.A. Day Jr. A.L. Underwood, *Quantitative Analysis*, 5th edition, Prentice Hall of India Private Ltd., New Delhi, 1988.

Course Outcomes

No.	Upon completion of the course the graduate will be	Cognitive	PSO
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	able to	Level	addressed
CO-1	Apply fundamental safety concepts to identify chemical risks and hazards. Demonstrate the use of fire classifications, OSHA guidelines and Personal Protective Equipment (PPE) to implement standard laboratory safety protocols and respond effectively to chemical emergencies.	Ap	PSO-1,2,3
CO-2	To analyse different concentration terms and evaluate the suitability of primary and secondary standards for quantitative analysis, and critically interpret the steps involved in preparing accurate standard and decinormal solutions	An	PSO-1,2,3,4
CO 3	To evaluate the acidity and alkalinity of various household and laboratory samples by applying pH concepts and measurement techniques using pH paper, universal indicator, and pH meter, and critically assess the reliability of different indicators in interpreting pH values.	E	PSO-1,2,3
CO 4	To design and perform quantitative titrimetric procedures and construct systematic qualitative analysis schemes by integrating principles of titration	C	PSO-1,2
CO 5	To design and execute analytical and independently create safe, efficient, and problem-specific experimental procedures for chemical analysis and laboratory safety improvement.	C	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: PRACTICAL SKILLS IN CHEMISTRY

Credits: 2:0:2 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	CO-1	PO-1,6 PSO-1,2,3	Ap	F, C	L	-
2	CO-2	PO-1,2,3,6 PSO-1,2,3,4	An	C, P	L	-



3	CO 3	PO-1,2,3,6 PSO-1,2,3	E	C, P	L	-
4	CO 4	PO-1,3,6 PSO-1,2	C	C, P, M	L	-
5	CO 5	PO-1,6 PSO-1,2,3	C	P, M	-	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	3	2	-	-	2	-	-	-	-	2	-	-
CO 2	2	2	2	2	-	1	2	2	-	-	2	-	-
CO 3	3	3	2	-	-	1	2	2	-	-	2	-	-
CO 4	2	3	-	-	-	1	-	2	-	-	2	-	-
CO 5	3	3	-	-	-	1	-	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓		✓	✓
CO 5	✓		✓	

