Name of the Programme: M.Sc. Part-I (Chemistry)

Course Code: CHA-521 **Title of the course:** Practical Course in Analytical Chemistry - I

Number of Credits: 02

Effective from AY: 2022-23

Prerequisites for the course:	Students should have studied chemistry practical courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.	
Course Objectives:	1. Introduction of various experimental techniques for analysis. 2. Learning data analysis, handling and interpretation of spectra.	
Content:	*This course consists of 7 units of experiments in various areas of Analytical chemistry. Minimum 13 experiments which include at least 02 experiments from unit 1-6 and 01 experiment from unit 7 shall be conducted.*	No of hours
	Unit 1: Statistics i. Calibration of selected Volumetric apparatus ii. Calibration of selected Laboratory instruments Preparation of standard solutions and standardisation.	9
	Unit 2: Colorimetry/ UV-Visible Spectrophotometry i. Estimation of Iron from Pharmaceutical sample (capsule) by thiocyanate method ii. Estimation of phosphoric acid in cola drinks by molybdenum blue method. iii. Estimation of KNO_3 by UV spectroscopy and $K_2Cr_2O_7$ by Visible spectroscopy iv. Simultaneous determination and Verification of law of additivity of absorbances ($K_2Cr_2O_7$ and $KMnO_4$).	8
	Unit 3: Flame Spectrophotometry and AES/AAS/ICP Spectroscopy i. Estimation of Na and K in food supplements or cosmetic products. ii. Estimation of Pb in water sample by AES/AAS/ICP. iii. Estimation of Fe and Al in Iron ore sample by AES/AAS/ICP.	9
	Unit 4: Ion Exchange Chromatography and High Pressure Liquid Chromatography i. Separation and Estimation of chloride and bromide. ii. Separation of Anthracene and Naphthalene using reverse phase chromatography iii. Separation of Benzaldehyde and Benzyl alcohol using normal phase chromatography	10
	Unit 5: Volumetric Titrations i. Estimation of Ca in pharmaceutical tablet.	10

	ii. Estimation of Al and Mg in antacid tablet. iii. Estimation of CaO in cement.	
	Unit 6: Solvent Extraction and spectrophotometry i. Extraction of Cu as copper dithiocarbamate (DTC) using solvent extraction and estimation by spectrophotometry. ii. Determination of Ni as Dimethylglyoxime complex by spectrophotometry. iii. Determination of Silver as ion association complex with 1,10-Phenanthroline and Bromopyrogallol red.	10
	Unit 7: Interpretation Exercises i. Thermal studies: TG/DTA and Isothermal weight loss studies of various hydrated solids like $CuSO_4 \cdot 5H_2O$, $Ca_2C_2O_4 \cdot H_2O$, $Fe_2C_2O_4 \cdot 2H_2O$. ii. X-ray powder diffractometry: Calculation of lattice parameters from X-ray powder pattern of cubic system such as $NiMn_2O_4$, $CoFe_2O_4$ etc. iii. IR spectra of Urea, benzoic acid, Copper sulphate pentahydrate etc.	4
Pedagogy:	Prelab exercises / assignments / presentations / lab hand-out or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.	
References / Readings:	1. J. H. Kennedy, Analytical Chemistry Principles, Saunders College Publishing, 2nd Ed., 1990. 2. G. D. Christian, Analytical chemistry, 5thEd., John Willey and Sons, 1994 3. J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis, 6thEd., Pearson Education Asia 2009. 4. A. J. Elias, Collection of interesting chemistry experiments, University press, 2002. 5. R.A. Day & A.L. Underwood, Quantitative Analysis, 6thEd., Prentice Hall, 2001. 6. J. Kenkel, Analytical Chemistry for Technicians, 3rdEd., Lewis publishers, 2002.	
Course outcomes:	1. Students will be able to explain how to determine an unknown concentration of solution. 2. Students will use statistical methods to analyse data in laboratory. 3. Students will be able to use different techniques for qualitative and quantitative estimation. 4. Students will be able to interpret TG/X-Ray/IR spectra.	