M.Sc. Semester I - Chemistry
PAPER: CHEM **404**: ANALYTICAL CHEMISTRY
[CSIR- UGC NET - TOPICS: 9(I), 9(P), 14(P)]

Total Credits – 3   **Total Hours - 45**

Objectives:

➢ To ensure the necessary selectivity and chemical purity of substances for domestic and industrial purposes as well as research work.

➢ To study the interaction of electromagnetic radiation with matter involving either absorption, emission, or scattering of radiation by the system under study where atomic and molecular spectra can provide detailed information about the structure and chemical properties of the system.

➢ To understand the spontaneous and non-spontaneous chemical reactions where electrons are transferred directly between molecules and/or atoms.

Unit-1 (A) Separation methods

Solvent Extraction, Chromatography: Gas Chromatography, High-Performance Liquid Chromatography, Capillary Electro chromatography, Ion-Exchange Chromatography, Ion Chromatography, Molecular Exclusion Chromatography, Affinity Chromatography, Hydrophobic Interaction Chromatography.

Unit-1 (B) Spectroscopic methods

Fundamentals of Spectrophotometry, Beer's Law, Fourier Transform Spectroscopy, Atomic Spectroscopy, Mass Spectrometry.

Unit-2 (A) Electrochemistry

Introduction, Electrolytic cell, Reversible and Irreversible cells, Electromotive force (EMF) and its measurement, Electrical and electrochemical potential, Different types of half-cells and their reduction potential, Nernst equation, EMF of cell and cell reaction, Standard potential, Ionic activity, Cell reaction and its relation with cell potential, Debye Huckel limiting law, Kohlrausch's law, Applications of Electrochemical cell, Potentiometric Titrations, Concentration cell, Concentration cell without liquid junction potential and with LJP, Commercial cells.

Unit-2 (B) Electro-Analytical techniques

Fundamentals of Electrolysis, Electrogravimetric Analysis, Coulometry, Amperometry, Voltammetry, Polarography, Electric Double Layer, Karl Fischer Titration of H_2O.

Unit-3 Data analysis

Mean and standard deviation; absolute and relative errors; linear regression; covariance and correlation coefficient.

References:

1. Quantitative Chemical Analysis by Daniel C. Harris Eighth Edition published by W. H. Freeman and Company 2014.
2. A Textbook of Physical Chemistry (Volume-3) by K.L. Kapoor Third Edition published by Macmillan Publishers India Ltd.2013.
3. Physical Chemistry by Gilbert W. Castellan Third Edition published by Addison-Wesley Publishing Company, Inc.1983.
4. Analytical Chemistry by Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug Seventh Edition Published by John Wiley & Sons, Inc. 2014.
5. Principles of Instrumental Analysis by Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch Sixth Edition Published by Cengage Learning, 2016.