

Elective-I for BE-I

CHEMICAL ANALYTICAL TECHNIQUES

L T P Cr
3 0 0 3.0

Course Objective

To provide fundamental knowledge of different chemical analytical techniques and related concepts.

Tools of Analytical Chemistry

Data Handling: Accuracy and precision, Significant figures, Rounding off, Determinate and indeterminate errors, Ways of expressing accuracy, Standard deviation, Significant errors and propagation of errors, Control charts, Confidence limit, Test of significance, Rejection of a result, Q-Test, Statistics for small sets of data, Linear least squares fitting, The correlation coefficient of detection limit, Statistics of sampling problems.

Sampling, Standardization and Calibration: Analytical samples and methods, Sampling and sample handling, Standardization and calibration, Figure of merit for analytical methods.

Classical Methods of Analysis

Gravimetric Methods of Analysis: Precipitation Gravimetry – Properties of precipitates and precipitating reagents, Colloidal precipitates, Coprecipitation, Drying and ignition, Calculation of results, Applications.

Titrimetric Methods of Analysis: Precipitation titrimetry, Primary standards, Standard solutions, Titration calculations, Types of titration curves.

Electrochemical Methods of Analysis

Introduction: Electrochemical cells, Electrode potentials, Nernst equation, Standard electrode potential and its limitations.

Potentiometry: Reference electrodes, Indicator electrodes, Glass electrodes, Gas sensing probes, Electrode calibration, Standard addition method, Potentiometric titration.

Conductometry: Introduction to conductometric method of analysis, Conductometric titrations.

Spectrochemical Methods of Analysis

Introduction: Electromagnetic radiation, Interaction of radiation and matter, Laws of radiation absorption and their limitations.

Atomic and Molecular Spectroscopy : UV and Visible molecular spectroscopy and their qualitative and quantitative applications, Atomic emission spectra, Plasma sources, Analyte atomization and ionization, Flame atomisers, Electrothermal atomizers, Atomic emission spectrometry, Interferences in plasma and flame atomic emission spectrometry. Atomic absorption spectrometry – Flame and electrothermal atomic absorption spectrometry and their applications.

Thermal and Chromatographic Methods of Analysis

Introduction: Thermogravimetry (TGA), Differential thermal analysis (DTA). Partition based chromatographic methods.

Course Outcome: The candidates shall acquire

1. the fundamental knowledge of tools of analytical chemistry like data handling, sampling, standardization, calibration and stoichiometric calculations.
2. the knowledge of classical, electrochemical and spectrochemical methods of analysis.

3. introductory knowledge of thermal and chromatographic methods of analysis.

Text Books

1. *Skoog, D.A., West, D.M. and Holler, F.J. Fundamental of Analytical Chemistry, Thomson Asia, Pte Ltd. Singapore (2008), 8th ed.*
2. *Khopkar, S.M., Basic Concepts of Analytical Chemistry, Wiley Eastern Limited, New age Publishers, (1998), 2nd ed.*

Reference Books

1. *Christian, G.D., Analytical Chemistry, Wiley (1994).*
2. *Skoog, D.A., Holler, F.J., and Crouch, S.R., Principles of Instrumental Analysis, Cengage Learning, (2007), 6th ed.*
3. *Willard, H. H. and Dean, J. A., Instrumental Methods of Analysis, Wadsworth Publishing Company, (1988), 7th ed.*