

ANALYTICAL INSTRUMENTATION

THEORY

Paper No.	: 6.3
Maximum Marks	: 100
Credits	: 4
Teaching Period	: 4 Theory + 1 Student presentation/ Seminar
Teaching Load	: 48 Theory + 12 Student presentation/ Seminar

UNIT 1

15 Periods

Electro analytical Methods of Analysis: Potentiometry: Introduction, reference electrode, indicator electrodes, ion-selective electrodes and their applications, instrumentation, measurement of cell unit, direct potentiometry, potentiometric titrations, applications.

Polarography: Basic principle, direct current polarography, different kinds of currents, reversible and irreversible waves, pulse and ac polarography, applications.

Conductometry: Conductometry as an analytical tool, applications of direct conductometric measurements, basis of conductometric titrations, applications of titration.

UNIT 2

15 Periods

Molecular spectro-analytical Methods of Analysis: Colorimetry and Spectro-photometry: Introduction, theory, Lambert-Beer's Law, limitations, types of monochromator and detectors, Instrumentation of single beam and double beam instrument, photometric errors.

Infrared Spectroscopy: Theory, instrumentation, Sample handling techniques, Fourier Transform Infrared Spectroscopy (FTIR), qualitative and quantitative applications, interpretation of Infrared (IR) spectra.

UNIT 3

8 Periods

Atomic Spectroscopy: Principle, Atomic transitions, atomic absorption, Atomic emission spectroscopy (AES), Atomic fluorescence spectroscopy (AFS), interferences, applications, Instrumentation of Flame photometer and atomic absorption spectrophotometer.

UNIT 4

10 Periods

Separation methods: Theory of chromatography, Principle, instrumentation and application of Thin layer chromatography (TLC), High pressure thin layer chromatography (HPTLC), Electrophoresis: Theory, Principle, Instrumentation of Horizontal and vertical electrophoresis. 10 Periods

Suggested Books:

1. Skoog & Lerry, Instrumental Methods of Analysis, Saunders College Publications, New York
2. D.C. Harris, Quantitative Chemical Analysis, W.H. Freeman

3. Christian G.D, Analytical Chemistry, John & Sons, Singapore
4. Skoog, West and Holler, Analytical Chemistry, Saunders College Publications, New York
5. Vogel's Textbook of Qualitative Chemical Analysis, ELBS
6. S.E. Manahan, Fundamentals of Environmental Chemistry, Lewis Publishers
7. J.A. Dean, Analytical Chemistry Notebook, McGraw Hill
8. R.A. Day and A.L. Underwood, Quantitative Analysis, Prentice Hall of India
9. John H. Kennedy, Analytical Chemistry: Principles, Saunders College Publications
10. W. Kemp, Organic Spectroscopy, ELBS

Practical in Analytical Instrumentation

1. Determination of pKa value for bromophenol blue using double beam spectrophotometer.
2. Spectrometric determination of iron using double beam spectrophotometer.
3. Determination of concentration of sodium, calcium, lithium and potassium in sample using flame photometer.
4. Determination of concentration of standard potassium ions in sample by standard addition method (Flame photometer).
5. Thin layer chromatographic (TLC) separation of samples from different origin (biological/pharmaceutical/food)
6. Group finding of Organic compound by IR spectroscopy
7. Spectrum analysis using FT-IR.
 - a) Qualitative analysis
 - b) Quantitative analysis
8. Analysis of various compounds using atomic absorption system.
 - a) Qualitative analysis
 - b) Quantitative analysis
9. Separation of blood haemoglobin using Agarose gel electrophoresis
10. Molecular weight determination of protein sample using SDS-PAGE.
11. To use potential measurements to quantify the hydrogen peroxide concentration in an unknown sample