

Second year of Five Years integrated M. Sc. (Physics)

M.Sc-II, Semester – III

MS 209 BASIC SCIENCE ELECTIVE (BSE)

Chemical Analysis by Instrumental Methods

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• **EVALUATION OF ANALYTICAL DATA** (07 Hours)

Calculation in analytical chemistry, calculation of stoichiometry-titrimetry, errors, determinate errors, correction of determinate errors, indeterminate errors, mean, median, standard deviation, variance, accuracy, precision, comparison of means, rejection of result- quotient test, least square method. Component, phase, degree of freedom, phase rule and its derivation. One component and two component systems.

• **SEPARATION METHODS** (07 Hours)

Gravimetric analysis – precipitation method, mechanism of precipitation, desirable properties of gravimetric precipitate, adverse ion effect, co precipitation, post precipitation, digestion, drying and ignition, errors in gravimetric analysis, inorganic and organic precipitating agents, organic reagents in inorganic reaction.

• **VOLUMETRIC METHODS** (07 Hours)

Primary standards, acid base pH-metric and conductometric titrations, theory of acid base indicators, potentiometric redox titration, complexometric and precipitation titration, caution in volumetric titrimetry, correction for unavoidable error.

• **CHROMATOGRAPHY** (07 Hours)

Terminology, classification, mechanisms, chromatographic performance, thin layer chromatography, column chromatography, paper chromatography, gas chromatography, ion exchange chromatography, High pressure liquid chromatography, retention factors, qualitative and quantitative analysis by chromatography.

• **ELECTROMAGNETIC SPECTRUM – UV-VIS ABSORPTION SPECTROSCOPY** (07 Hours)

Interaction of radiation with matter, absorption of radiation by molecules, UV-Vis absorption spectroscopy- Beer-lambert's law, molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation, concept of chromophore and auxochrome, bathochromic, hypsochromic, hyperchromic and hypochromic shift, UV conjugated enes and enones.

• **VOLTAMETRY** (07 Hours)

Polarography at DME (DC polarography), DME advantages limitation, half wave potential, Ilkovic equation, different currents in polarography, applications in inorganic and organic analysis. Coulometry- Principles of electrolysis, electrolysis at constant potential, electrolysis at constant current, coulometric methods of analysis, applications of coulometry potentiostatic and amperostatic, coulometric titration.

(Total Contact Time (Theory): 42 Hours)

BOOKS RECOMMENDED:

1. **Dean J. A.**, *Chemical Separation Methods*, Van Nostrand Reinhold, 1970.
2. **Ewing G. W.**, *Instrumental Methods in Chemical Analysis*, 5th Edn., McGraw-Hill, 1985.
3. **Willard H. H., Merrit L. L., Dean J. A. and Settle F. A.**, *Instrumental Methods of Analysis*, 6th Edn., Van Nostrand Reinhold, 1980.
4. **Vogel A. I.** *A text book of quantitative chemical analysis*, ELBS UK, 5th Edn, 1996.
5. **Banwell C. N.**, *Fundamentals of Molecular Spectroscopy*, Tata McGraw Hill, 1983.