II SEMESTER

ICH 451: ANALYTICAL CHEMISTRY

Course Objectives:

- To understand different types of titrations and the errors.
- To learn different chromatographic techniques.
- To study different physical techniques.
- To learn the principle and applications of different spectroscopic and diffraction methods.

UNIT I **14 hr**

Preparation of samples for analysis, nature of errors, statistical treatment of errors, the t- and F-tests, significant figures, rejection of data. Precipitation phenomena: Precipitation from homogeneous solutions, organic precipitants in inorganic analysis. Solvent extraction of metal ions, nature of extractant, distribution law, partition coefficients, types of extractions and applications. Theories of redox indicators, titration curves, feasibility of redox titrations. Chelometric titrations-titration curves with EDTA, feasibility of EDTA titrations, indicators for chelometric titrations, selective masking and demasking techniques, industrial applications of masking.

UNIT II **14 hr**

Chromatographic Techniques: Principles, classifications and theory of chromatographic separations. Column chromatography: Principles,Differential migration,Separation of a mixture of o/p-nitroanilines

Gas Chromatography: Principles, columns, detectors-TCD, FID, ECD and column efficiency, capacity factors, resolution. Practical aspects of GC-Hypernated techniques.Liquid Chromatography HPLC: Principles, equipment, columns, detectors, choice of column, materials GC, GCMS and LCMS.

Ion exchange chromatography: Structures of resins, Types,Theory and apparatus,selectivity, Applications. Thin layer chromatography: Principles, selection of stationary and mobile phases,Preparative TLC, ApplicationsPaper chromatography: Theory and principle. Techniques: one, two- dimensional and circular paper chromatography. Mechanism of separation, structure of cellulose and types of paper. Methodology- Factors affecting Rf values. Advantages and applications.

UNIT III **14 hr**

Electroanalytical Techniques

Introduction, theory, principle, methodology, instrumentation and application of the following tecniques: Conductometry, Potentiometry, Coulometry, Voltammetry.

Light -Scattering methods: Nephelometry & turbidimetry theory, effects of concentration, particle size & wavelength on scattering, instrumentation & application.

Fluorometry and phosphorimetry: Introduction, fluorescence and phosphorescence, factors affecting fluorescence and phosphorescence, internal conversion, intersystem crossing (radiationless processes) quenching. theory, relationship between intensity of fluorescence and concentration, instrumentation– basic differences in the measurement of fluorescence and phosphorescence, spectrofluorometers, advantages and disadvantages

UNIT IV Advanced instrumental techniques: **14 hr**

Spectrophotometry, Atomic spectroscopy

Surface probe microscopy: Atomic force microscopy, Scanning tunnelling microscopy, Field emission scanning electron microscopy, Transmission electron microscopy.

Thermal Analysis- TG, DTA and DSC- Principles and applications.

X-ray diffraction techniques- Powder and single crystal XRD, principle, techniques and applications.

Course Outcome:

- Students get to learn how to measure errors during estimations
- Chromatographic techniques namely, gas chromatography, liquid chromatography, ion exchange chromatography, TLC and paper chromatography.
- Electroanalytical techniques with advance instrumental technique such as surface probe microscopy, thermal analysis and X-ray diffraction analysis.

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