

Department of Inorganic and Analytical Chemistry

M.Sc Final Chemistry

Syllabus for III rd Semester

Specialisation : *Analytical Chemistry*

Paper - IV: *Instrumental Methods of Analysis - I*

Unit - I : Spectroscopic Methods - 1

- (a) *UV-Visible Spectroscopy*: laws of absorption, deviation from Beer's law, single and double beam spectrophotometers-instrumentation, "sources of radiation, detectors, qualitative analysis by absorption measurements, general precautions in colorimetric determinations, determination of certain metal ions by using ligands - Fe^{2+} , Fe^{3+} , Al^{3+} , NH_4^+ , Cr^{3+} , Cr^{6+} , Co^{3+} , Cu^{2+} , Ni^{2+} and anions - NO_2^- , PO_4^{3-} using suitable reagents, simultaneous determinations of dichromate and permanganate in a mixture, spectrophotometric titrations, principle of diode array spectrophotometers.
- (b) *Spectrofluorimetry*: Theory of fluorescence, phosphorescence, factors affecting the above, quenching, relation between intensity of fluorescence and concentration, instrumentation, application with reference to Al^{3+} , chromium salts, fluorescence, thiamin (B1) and riboflavin (B2) in drug samples.

Unit - II : Spectroscopic Methods -2

- (a) *NMR Spectroscopy*: resonance condition, origin of NMR spectra, instrumentation, chemical shift, factors affecting chemical shift, shielding, spin-spin splitting, mechanism for spin-spin coupling, interpretation of NMR spectra of typical organic compounds, factors influencing NMR spectra, fast chemical reactions, magnitude of I, nuclei with quadrupole moments, FT NMR, study of isotopes other than proton- ^{13}C , ^{15}N , ^{19}F , ^{31}P , ^{11}B , double resonance, spin tickling, shift reagents, applications.
- (b) *ESR Spectroscopy*: principle, g value, hyper fine splitting, qualitative analysis, Krammers degeneracy, fine splitting, instrumentation, introduction to double resonance technique, difference between ESR and NMR, quantitative analysis, application to study of free radicals and other analytical applications.

Unit - III : Spectroanalytical Methods of Analysis

- (a) *Flame photometry*: theory, instrumentation, combustion flames, detectors, and analysis of Na, K, Ca, Mg
- (b) *Atomic Absorption Spectrometer*: theory, instrumentation, flame and non-flame techniques, resonance line sources, hollow cathode lamp, instrumentation, chemical and spectral interferences, applications with special reference to analysis of trace metals in oils, alloys and toxic metals in drinking water and effluents
- (c) *Inductively coupled plasma spectrometer(ICP-AES, ICP-MS)*: principles, instrumentation, plasma, AES detectors, quadrupole mass spectrometers, difference between the two detectors, analysis methods for liquids and solids, applications in the analysis of trace and toxic metals in water, geological and industrial samples.