

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Defence Science)
Semester: II
Syllabus with Effect from: June - 2014

Paper Code: PT02CDSC03	Total Credit: 4
Title Of Paper: Characterization Techniques	

Unit	Description in Detail	Weightage (%)
I	<p>Spectroscopic Techniques UV-Visible Molecular Absorption Spectrometry: Transmittance and Absorption, Beer's law and its applications to mixtures, Deviation from Beer's law, Instrument components, Types of instruments (Single beam, double beam, multichannel etc.) Applications: Molar Absorptivity, Absorption by Organic Compounds, Inorganic Compounds and Charge transfer complexes, Detection of functional groups, Quantitative analysis, Photometric Titrations. IR Spectrometry: Introduction, theory, Types of vibrations and rotations, Mechanical model, Quantum treatment, Selection Rules and vibrational coupling, Instrumentation-Design and Components, Dispersive and non-dispersive instruments, Source and Transducers. Applications of Near-, Mid- and Far- IR, Sample preparation, Qualitative analysis (group frequencies, fingerprint region) and Quantitative applications – analysis of mixtures of aromatic hydrocarbons, determination of air contaminants, applications of NIR absorption and reflectance spectroscopy.</p>	25%
II	<p>NMR and Mass Spectrometry Nuclear Magnetic Resonance Spectrometry: Theory of NMR (quantum description, energy levels, classical descriptions, relaxation processes), FT NMR, Environmental effects on NMR spectra (types, origin of chemical shift, spin-spin splitting, theory of chemical shift). Applications of ¹³C-NMR (quantitative analysis, structure determination, applications to solid samples). Molecular Mass Spectrometry: Molecular Mass Spectrum, Ion Sources and types, Ion Sources and spectra, Desorption sources and Methods-MALDI, ESI, Instrumentation (General Description and Instrument components, Resolution and Analyzers). Applications: Identification of pure compounds, Molar masses, Molecular formula, Structural information, Analysis of mixtures, Quantitative applications.</p>	25%
III	<p>Thermal Methods Types of Techniques: TGA, DTA, DSC and Microthermal methods, (Instrumentation and components of each of above), Combined Thermal Instruments- TGA-MS, TGA-FTIR. Applications: TGA for monitoring Kinetics and Physical processes induced by temperature in inorganic and polymeric materials. DTA- Polymer Characterization, DSC-Glass Transition Temperature, Crystallinity and Reaction Kinetics of processes involving polymers.</p>	25%
IV	<p>Scattering and X-Ray Methods Scattering Methods: Low angle Laser Light Scattering and Dynamic Light Scattering, Introduction to Particle Size Analysis, Instrumentation,</p>	25%



Theoretical models, Size distribution analysis. Applications for polymer solution and colloidal dispersions. X-Ray Methods: Spectral Lines, X-Ray tubes, X-ray Emission, Spectrum, Absorption, Instrumentation and Detectors, Chemical analysis by X-ray absorption, X-Ray Fluorescence and Chemical analysis, X-Ray Diffraction methods and Structural elucidation.	
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Basic Text & Reference Books:-

- Introduction to Instrumental Analysis, Robert D. Braun, Pharma-Med Press
- Fundamentals of Analytical Chemistry, Skoog, West, Holler, Harcourt College Publications
- Instrumental Methods of Analysis, Willard, Merritt, Dean, Settle, CBS Publications, New Delhi
- Solid State Chemistry-An Introduction, Lesley E. Smart, Elaine A. Moore, CRC Press
- Instrumental Analysis, Skoog, Holler, Crouch, India Edition
- Principles of Instrumental Analysis, Holler, Skoog, Crouch, Thomson

