

SSP-S 329

2009-2010

**Department of Physics, A.U**  
**ANALYTICAL TECHNIQUES**

(Choice Based Paper to be offered in the Dept., of Physics during 3<sup>rd</sup> Semester for  
other Dept., students in AU Campus only)  
(W.e.f. 2012 – 2013 admitted batch)

**Unit I**

Concepts of interaction of electromagnetic radiation with matter, wave and particle properties of electromagnetic radiation, electromagnetic spectrum, absorption laws, electronic transitions, optical and molecular spectra, molecular energies, Raman spectra, Dispersion of radiation, photoelectric effect, photoelectric cells, X-ray scattering, Compton effect, radiation sources, detectors, lasers, photometric analytical methods.

**References :**

- 1) Instrumental methods of analysis, Willard, Merritt, Dean, Settle (CBS Pub.)
- 2) Instrumental methods of chemical analysis, H. Kaur (Pragati Prakasan Pub.)

**Unit II : Ultrasonic techniques**

Introduction, Physical acoustics, low frequency bulk acoustic wave (BAW), surface acoustic wave (SAW), piezoelectric materials, high power ultrasonics, medical ultrasonics, acousto-optics, under-water acoustics, and seismology, non-destructive evaluation of materials, medical applications, acoustic microscopy (biological samples)

**References:**

- 1) Fundamentals and Applications of Ultra-sonic Waves, John David Cheeke, (CRC Press), 2002
- 2) Ultrasonics, Fundamentals, Technology and Applications, Dale Ensminger, (CRC Press) 1988.
- 3) Fundamentals of Ultrasonics, Jack Blitz

**Unit III : Magnetic Resonance Techniques**

1) Electron Spin Resonance: Basic Concepts, g-factor and nuclear hyperfine interaction, line shapes and widths, sensitivity of detection and quantification, essential features of an ESR spectrometer, Applications of ESR: in Physical Sciences and biological systems, study of free radicals and their significance.

2) Nuclear Magnetic Resonance: Basic principles, continuous wave and pulsed NMR, time domain, frequency domain and the Fourier Transform, measurement of spin-lattice and spin-spin relaxation times, proton and C-13 NMR, basic pulsed Fourier Transform NMR spectrometer, 2D NMR, Magic angle and cross polarization technique applied to solids, applications of NMR in physical and biological sciences, basic features of MRI.

3) Nuclear quadrupole resonance: Basic principle and applications

**Unit IV : Structural characterization techniques**

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