PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Paper 2: ANALYTICAL TECHNIQUES

Offered to : M.Sc.(PHYSICS)	Course Code : 22PH4D1
Course Type : Domain specific elective (DSE)	Course : Analytical Techniques
Year of Introduction : 2022	Year of offering : 2023
Year of Revision : 2022	Percentage of Revision : Nil
Semester : IV	Credits : 4
Hours Taught : 60 hrs. per Semester	Max.Time : 3 Hours

CourseDescription:

Analytical Techniques course is aimed to train the students the principles, basic theory,instrumentation and applications of selected analytical instruments. Analytical technique is a method thatis used to determine a chemical or physical property of a material.

Course Objectives:

1. To understand the theory of different analytical techniques.
2. To develop the skills to practice of analytical techniques.
3. To establish an appreciation of the role of Physics in quantitative analysis.
4. To provide scientific understanding of analytical techniques.
5. To provide the detail interpretation of results.

Course Outcomes: At the end of this course, students should be able to:

CO1: Understand the basic concept of theory and experimental methods of Nuclear Magnetic Resonance.
CO2: Analyse the fundamental of Electron Spin Resonance (ESR).
CO3: Analyse the process of Nuclear Quadrupole Resonance (NQR) spectrometer.
CO4: Apply the concepts of Electron spectroscopy to analyse the properties of materials.
CO5: Understand the concepts of Mossbauer Effect and applications.

CO-POMATRIX								
	CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
22PH4D1	**CO1**	H					L	M
	CO2		M				L	M
	CO3		M				L	M
	CO4		H				L	M
	CO5	H	M				L	M

Syllabus		
Unit	**LearningUnits**	**Lecture Hours**
I	**NuclearMagneticResonance** Nuclear spin and magnetic moment, theory of NMR, chemical shift, Relaxation mechanisms,Spin-lattice(T1),spin-spin(T2)relaxationtimesbypulsemethods,Blochequations,Theoryofrelaxationmechanisms for spin ½ nuclei, Proton NMR, Carbon-13 NMR and Experimental methods, CW NMRspectrometerandapplications.	12
II	**ElectronSpinResonance** Magnetic moment of an electron, two states of an electron in a magnetic field, ESR theory- Spin-spininteraction, Spin-lattice interaction - Hyperfine interaction-g factor, Characteristics of g and A values,LinewidthsandIntensities,Relaxationeffects,Experimentalmethods–ESRSpectrometerandapplications.	12
III	**NuclearQuadrupoleResonance** Nuclear Quadrupole Resonance spectroscopy, fundamental requirements of NQR spectroscopy, Generalprinciples, Integral spins and Half integral spins, Experimental detection of NQR frequencies, BlockdiagramofNQR spectrometer–Experimental methodsofSRoscillator, CWoscillator,pulsemethods.	12
IV	**ElectronSpectroscopy** Photo electron spectroscopy- theory- Instrumentation- Applications, Energy Dispersive Spectra (EDS),AugerElectronSpectroscopy(AES),ScanningElectronMicroscope,TransmissionElectronSpectroscope,DifferentialScanningCalorimeter,DifferentialThermalAnalysisandThermalGravimetricAnalysis.	12
V	**MossbauerSpectroscopy** The Mossbauer Effect, Recoilless Emission and Absorption, The Mossbauer Spectrometer, Experimentalmethods,Chemicalshift,Quadrupoleinteraction,MagneticHyperfineinteractionsandapplications.	12

TextandReferenceBooks:

1. NuclearMagneticResonance,E.R.ANDREW(CambridgeUniversityPress).
2. Spectroscopy, B.P.STRANGHANandS. WALKER,Volume-I(JohnWiley& Sons).
3. PulseandFourierTransformNMR,T.C.FARRAR andE.D. BECKER,(AcademicPress).
4. MolecularStructureandSpectroscopy, G.ARULDAS (PrenticeHallofIndia).
5. BasicPrinciplesofSpectroscopy,RAYMONDCHANG(McGrawHill).
6. MossbauerEffectandItsApplications,V.G.BHIDE(McGrawHill).