

BSP505P					NUCLEAR AND PARTICLE PHYSICS LABORATORY					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	Viva	
0	0	2	1	2	0	0	0	50	50	100

### COURSE OBJECTIVES

- ☐ To introduce a range of experimental data acquisition and analysis techniques employed in nuclear physics.
- ☐ To develop hands on experience of GM counter, Scintillator detector, Multi channel analyser and other electronics involved.
- ☐ To learn basic precautions while handling alpha and gamma sources in the laboratory.

### LIST OF EXPERIMENTS

1. Study of the characteristics of a GM tube and determination of its operating voltage, plateau length/slope.
2. Verification of inverse square law for gamma rays.
3. Study of nuclear counting statistics
4. Measure Linear & Mass attenuation co-efficient using gamma source for Aluminium
5. Estimation of efficiency of the GM detector for gamma and beta sources
6. Study of beta particle range and maximum energy
7. To analyse the complete energy spectra for Gamma Rays from  $^{60}\text{Co}$  and  $^{137}\text{Cs}$  radioisotopes.
8. Scintillation detector-energy calibration, resolution and determination of gamma ray energy
9. Solid State Detector-surface barrier detector, its characteristics and applications
10. Determine the thickness of a thin film by Rutherford backscattering spectrometry.
11. Verify the laws of Compton scattering.
12. Determine the gamma activity of an unknown radioisotope by relative method.
13. Study the energy dependence of the absorption coefficient of aluminium and lead.

### Course Outcomes:

Student will be able to;

CO1: Identify and suggest detector for measuring the basic specific property in nuclear and particle physics.

CO2: Determine the rate of decay of various alpha, beta and gamma sources.

CO3: Extend the scope of an experiments for other unknown elements other than aluminium and lead.

CO4: Describe the working and detection principles of GM counter, scintillation detectors, surface barrier detector and so on.

CO5: Analyse the properties of radiation in nuclear physics experiments of attenuation and absorption coefficients of Aluminium and other materials.

CO6: Apply interaction of radiation with matter knowledge in the experiments along with basic electronics of MCA, SCA, cables and PMT.

### Text and Reference Books:

1. Laboratory manual for GM experiments and Scintillation detector experiments.

2. Radiation Detection and measurement by G. F. Knoll, Ann Arbor Science Publishers (1980)
3. Techniques for Nuclear and Particle Physics Experiments by William R. Leo , Publisher: Springer