PHY7107: NUCLEAR SPECTROSCOPY

1. Course Name: Nuclear Spectroscopy

2. Course Code: PHY7107

3. Credit Units: 3

4. Course Description:

This course discusses radiation measurements and spectroscopy.

5. Course Objectives:

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

- Differentiate between different types of decay processes.
- Obtain the Fermi theory of beta decay.
- Give an account of interaction of radiation with matter.

6. Course Outline:

Content	Hours
Alpha, beta and gamma decay processes; Theory of gamma decay; Quantum mechanical tunneling.	4
The Gamow factor, alpha decay spectroscopy; Types of beta decay processes; X-rays following beta decay, the Fermi theory of beta decay	5
Energetics of gamma decay, internal conversion, isometric transitions, branching ratios and life-times of excited states;	5
Radiation sources and fields	3
Review of the interaction of gamma rays with matter; Charged particle accelerations; Ion sources and principles of acceleration; A survey of accelerator types	5
Principles of radiation detection	3
Review of interaction of radiation with matter; Ionizations and excitations	5

Survey of detector types; Gas-filled, scintillation and [semiconductor detectors- NaI (TI) detectors, characteristic] and resolving time; liquid scintillation counting, quenching;	5
Solid state (semiconductor) detectors- the HPGe and HPI detectors, photo-peak efficiencies and multi-channel pulse height analysis; Detectors resolution measurement statistics	5
Total	**45**

7. Mode of Delivery:

This course will consist of lecture sessions and there will also be data analysis using theories leant.

8. References:

1. K.S. Krane, Introductory Nuclear Physics. John Wiley. (Textbook)
2. S.W.C. Williams. Nuclear and Particle Physics. Oxford Science Publications
3. H Enge. Introduction to Nuclear Physics. Addison – Wesley
4. Cottingham. Introduction to Nuclear Physics. Cambridge Univ. Press.