Module code	SP-4308			
Module Title	Nuclear and Particle Physics			
Degree/Diploma	Bachelor of Science (Applied Physics)			
Type of Module	Major Option			
Modular Credits	4	**Total student Workload**	10	hours/week
		Contact hours	4	hours/week
Prerequisite	None			
Anti-requisite	None			

Aims

The module is designed for students to understand the physics principles underpinning nuclear and particle physics.

Learning Outcomes

On successful completion of this module, a student will be expected to be able to:

Lower order :	20%	- describe the patterns of nuclear masses and sizes using simple models and identify the basic constituents of matter and the fundamental forces between them
Middle order :	50%	- apply calculations involving the energy released by important nuclear decays and reactions - analyse various types of nuclear decay processes using quantitative calculations on radioactivity - apply conservation laws to identify the forces responsible for particular reactions - apply Feynman diagrams to represent elementary processes
Higher order:	30%	- interpret the results of analyses, and make an appropriate report for an effective communication - present case studies or current issues or specific topics individually or collaboratively - work co-operatively in a team

Module Contents

Nuclear Physics:
- Rutherford Scattering, properties of nuclei- Mass, size, charge, magnetic moment
- Nuclear stability, binding energy and nuclear forces
- Nuclear models, The shell model and liquid-drop model, Radioactivity- half-life estimation
- Decay processes, Alpha, Beta & Gamma Decay
- Natural Radioactivity- carbon dating, radiation dosage

Particle Physics:
- Basic properties of cosmic rays, particle accelerators and detectors
- The four forces, the quest for unification and links with cosmology
- The Standard Model, fermions and their gauge bosons;
- Leptons and the electroweak force
- The Higgs mechanism and Higgs boson, The strong force, Quarks and gluons

Assessment	Formative assessment	In-class questions and feedback
	Summative assessment	Examination: 40%
		Coursework: 60% - 2 work-based problems (20%) - 1 group project (10%) - 1 written assignment (10%) - 1 oral presentation (10%) - 1 class test (10%)