

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			
<i>On successful completion of this module, a student will be expected to be able to:</i>			
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%)	