Module code	SP-2301			
Module Title	Concepts in Modern Physics			
Degree/Diploma	Bachelor of Science (Applied Physics)			
Type of Module	Major Option			
Modular Credits	4	**Total student Workload**	8	hours/week
		Contact hours	4	hours/week
Prerequisite	None			
Anti-requisite	SP-2202 Concepts in Modern Physics			

Aims

This module aims to introduce students to post-Newtonian concepts in physics that involve theories that were developed in the twentieth century.

Learning Outcomes

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

Lower order :	30%	- understand the basic principles related to modern physics, which includes relativity, matter waves, energy quantisation, x-ray and also laser generation, and the nuclear structure
Middle order :	60%	- evaluate the effects of special relativity on time and length measurements - explain and apply equations developed to the effects of relativity on momentum and energy - explain and apply the concept of matter wave and wave-particle duality - apply the concept of atomic energy quantization to the electronic structure of atoms - explain the electronic transition process for x-ray generation and atomistic process for laser generation - explain quantized properties of nuclei contents
Higher order:	10%	- communicate concepts effectively - work independently and also participate as a team member in group discussions and problem solving sessions

Module Contents

- Einstein's special theory of relativity.
- Lorentz transformation equations to cover mechanics at all speeds, from which a basis for developing effects of relativity on other physical quantities like velocity, momentum, and energy will be established.
- Development of the idea of rest energy and a new definition of kinetic energy leading to the development and evaluation of Einstein's mass-energy relationship ($E=mc^2$).
- An introduction to the concepts photons, matter waves, and wave-particle duality.
- Wave function and the consideration of Schrödinger's equation to represent electron trap.
- The concept of quantization of atomic energies and the use of quantum numbers in describing energy states as well as a discussion of the periodic table.
- The electronic and atomistic process for x-ray and laser generation.
- An exploration of the quantum nature of the nuclear contents and their applications in NMR and MRI.

Assessment	Formative assessment	Discussions, tutorials and feedback
	Summative assessment	Examination: 60%
		Coursework: 40% - 2 tests (20%) - 1 report and 2 assignments (20%)