Module code	SP-1303		
Module Title	Thermal Physics and Optics		
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	A-level Physics or equivalent		
Anti-requisite	SP-1203 Thermal Physics and Optics		

Aims

This module aims to provide students with a logical presentation of the basic concepts and principles of thermal physics and optics in physics and strengthen the understanding of the concepts and principles through a range of real-life applications.

Learning Outcomes:

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

Lower order :	30%	- recognise the three phases of matter: solid, liquid and gas, how their properties depends on thermal motion and the forces between atoms and molecules, describe the fundamental concepts related to various forms of energy: internal, enthalpy, entropy, free internal energy and free enthalpy - describe the basic concept of thermal equilibrium - describe the basic phenomena due to light matter interaction.
Middle order :	60%	- describe polarization and the properties of polarizing components - describe the concept of quantum nature of light and discuss the limitations of classical optics, derive the thermodynamic temperature scale from the operation of an ideal Carnot heat engine - recognise the fundamental limits for the efficiency of heat engine
Higher order:	10%	- describe interferometer principles and its applications. - describe and apply the basic principles of geometrical optics. - describe the kinetic theory of gases and how this theory can be applied to what is actually observed in real gases - explain and use laws of thermodynamics to solve simple problems related with heat and work changes to practical systems.

Module Contents

-Thermal Physics: - The Zeroth law of thermodynamics, thermometry and temperature scales, thermal expansion, heat capacity and phase changes, heat transport and its applications, First law of thermodynamics, internal energy and heat capacity, reversible and irreversible processes, enthalpy, thermal efficiency, applications of first law of thermodynamics; Second law of thermodynamics, entropy, entropy changes, applications of combined first and second laws of thermodynamics; The kinetic theory of gases, adiabatic processes for an ideal gas, the equipartition of energy, distribution of molecular speeds, mean free path, molar specific heats, Maxwell-Boltzmann speed distribution function, modification of kinetic theory for real gases.
- Optics: Review of light theory; Ray approximation in geometrical optics, reflection, refraction, Huygens's principle, dispersion and prisms, Fermat's principle, image formation, thin lens equation, multiple thin lenses, thick lenses, lens aberrations, Optical systems, interference, diffraction, thin-film interference, Michelson interferometer, diffraction grating, x-ray diffraction and polarization.

Assessment	Formative assessment	Class test, discussions and feedback
	Summative assessment	Examination: 60%
		Coursework: 40% - 2 assignments (1 per section) (40%)