Module code	SP-4303			
Module Title	Renewable Energy			
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	SP-1303 or SP-1203 Thermal Physics and Optics			
Anti-requisite	None			

## Aims

This module emphasis is on renewable and sustainable energy sources and introduces the students to the nature of alternatives to traditional energy sources. How these renewables could be used to generate and store either green electricity or bio-fuels and the technologies involved for these conversion processes.

## Learning Outcomes

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

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Lower order :	40%	<ul> <li>- understand the basic principles of renewable energy technologies for local and non- local situations</li> <li>- understand the working knowledge of PV generator</li> </ul>	
Middle order :	40%	<ul> <li>-describe the nature and scope of alternative energy, the application of electricity</li> <li>- compare different methods generating electricity, compare different techniques for storage and use of electricity</li> <li>-describe the applications and operation of different non electric energy systems, identify ways to better manage energy consumption</li> <li>-describe energy conservation techniques</li> </ul>	
Higher order:	20%	-design PV standalone and hybrid systems, interpret and discuss the results of	

## Module Contents

Review of thermodynamics, fossil fuels, the electrical national power grid in Brunei, renewable energies and power production:

- Photovoltaic: PV solar cells, working of solar cells, effect of solar radiation, working temperature and shading on the performance of PV cells in natural and indoor environment, energy losses, designing of PV generators; Solar Thermal Energy: solar thermal devices, active and passive use of solar thermal energy, Solar Electricity: Photovoltaic and solar thermal
- Wind Energy: wind energy conversion system, wind resource analysis, wind farms
- Hydroelectric: hydroelectric power systems, pumped hydro; Geothermal Energy: resources, exploration and generation of electrical power, dry stream, flash stream and binary cycles power plants; Oceanic Energy: wave energy, tidal energy, ocean thermal energy
- Hydrogen Technology: production, safety and uses; Bio-energy: biomass and bio-fuels
- Fuel Cells: types of fuel cells theory and their applications; Energy Storage: mechanical, electrochemical, electrical and thermal; Energy Efficiency: energy management, environmental impact of different types of energy, energy conservation, outlook of fossil and green energy

Assessment	Formative	Discussions and feedback
	ussessment	
	Summative	Examination: 60%
	assessment	Coursework: 40%
		- 2 reports (20%)
		- 1 test (10%)
		- 1 project (10%)