Module code	SP-4311			
Module Title	Polymer 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

This course presents the mechanical, optical, thermal and transport properties of polymers with respect to the underlying physics and physical chemistry of polymers in melt, solution, and solid state.

Learning Outcomes

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

Lower order :	0%	Nil
Middle order :	30%	- Interpret microstructure of polymers and relate with properties - evaluate polymeric materials for specific applications
Higher order:	70%	- explain key concepts in polymer physics - analyse shapes ,size and morphology of- polymers and interpret microstructures - explain behaviour of polymers using physical techniques such as, spectroscopy (NMR, Raman, UV-Vis,..etc) and chromatography - correlate polymer microstructure with their properties such as mechanical , optical, thermal and electronic - work independently and also collaboratively in a team - interpret the results of analyses, and make appropriate reports and presentations for effective communication

Module Contents

The main contents of the module are:

- Basic concept of polymers: History of the development of synthetic polymers and chemical nature of polymers.
- Classification of polymers: Thermoplastic versus thermoset polymers, amorphous versus crystalline polymers.
- Molecular sizes and shapes and ordered structures: Distributions of molar mass and their determination, the shapes of polymer molecules, evidence for ordered structures in solid polymers.
- Morphology: crystallinity, orientation
- Mechanical Properties: strength, modulus, elongation, hardness
- Thermal properties: glass transition temperature, heat capacity, thermal conductivity, thermal expansion coefficient
- Optical properties: light transmission, refractive index.
- Electrical properties: surface and volume resistivity, dielectric constant, electronic conductivity, ionic conductivity, piezoelectric.
- Some physical techniques for studying polymer: Differential scanning calorimetry (DSC) and differential thermal analysis (DTA), Density measurement, Light scattering, X-ray scattering, Infrared and Raman spectroscopy, NMR technique, Optical and electron microscopy.
- Applications of polymers, processing, environmental issues and recycling.

Assessment	Formative assessment	In-class questions will be used to test and give feedback on learning.

	Summative assessment	Examination: 0% Coursework: 100% - Two (2) class tests (30%) - One (1) group work (20%) - Two (2) written assignment (40%) - One (1) oral presentation (10%)