Module code	SM-4311			
Module Title	Applied Mathematical Methods I			
Degree/Diploma	Bachelor of Science (Mathematics)			
Type of Module	Major Option			
Modular Credits	4	**Total student Workload**	10	hours/week
		Contact hours	4	hours/week
Prerequisite	SM-2201 Ordinary Differential Equations and SM-2202 Multivariate Calculus			
Anti-requisite	None			

Aims

The module is designed for students to introduce and understand an array of important mathematical tools and techniques and methods which: (a) build on knowledge gained in the first two years of the mathematics programme, (b) will be used in later modules, especially in applications.

Learning Outcomes

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

Lower order :	40%	- understand the basic principles of important mathematical tools, techniques & methods - Understand how to apply these mathematical tools, techniques & methods in scientific problems.
Middle order :	40%	- analyse the various mathematical tools, techniques and methods and when to use them if necessary.
Higher order:	20%	- interpret the results of analyses, and make an appropriate report for an effective communication - work independently and play effectively in collaboratively in a team, especially in tutorial class.

Module Contents

- Orthogonal Curvilinear Coordinate System and Tensor: Coordinate transformation, invariant properties of tensors under coordinate transformation, Basis and reciprocal basis vectors, Dyadic representations. Einstein summation notation, Levi-Civita Tensor, Expressions for gradient, divergence, Laplacian and curl of a vector in an orthogonal curvilinear coordinate system.
- Orthogonal Functions: Expansion of functions in orthonormal functions, Fourier series, full range and half range sine and cosine series, convergence.
- Sturm-Liouville Problems: Characteristic values and characteristic functions. Basic theorem, orthogonality of characteristic functions.
- Ordinary Differential Equations: Solution in power series, method of Frobenius, Legendre differential equation, introduction to Legendre and Bessel functions and some important properties.
- First Order Partial Differential Equations: Characteristic curves. Solution of initial value problems by the method of characteristics.

Assessment	Formative assessment	Tutorial and feedback.
	Summative assessment	Examination: 60%
		Coursework: 40% - 3 tests (40%)