Module code	SM-4329			
Module Title	Numerical Approximation			
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-2204 Numerical Analysis			
Anti-requisite	None			

Aims

The aim of this module is to introduce various data approximation methods such as the least square approximation, approximation by interpolation by polynomials, splines and radial basis functions, to study some techniques from Computer Aided Geometric Design (CAGD) for the construction of curves and surfaces, and to introduce Wavelets and its application to signal and image processing.

Learning Outcomes

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

Lower order :	30%	- apply the best approximation in inner product space - apply the method of interpolation using natural cubic spline, B-splines and radial basis functions - apply Wavelets and its application to signal and image processing
Middle order :	60%	- develop and analyse several algorithms for computing approximation of functions
Higher order:	10%	- construct curves and surfaces using Bezier curves and B-Splines - construct wavelets and apply them to signal and image processing - work independently and in a team

Module Contents

The main contents of the course are:

- Introduction: Norms, Normed linear spaces, Weierstrass Theorem.
- Least Squares Approximation: Inner product spaces, Projection Theorem, Computation of the best approximation, Construction of an orthogonal basis for a finite dimensional subspace of inner product space, orthogonal polynomials.
- Interpolation: Interpolating Polynomial, Runge's Interpolation, Cubic Splines, Minimum Norm Interpolant, Computation of Natural Cubic Spline, and Interpolation with Radial Basis Functions.
- Topics in Computer Aided Geometric Design: Cubic Bezier Curves, Cubic B-spline Curves.
- Wavelets: Multiresolution Analysis, Orthogonal Splitting and Wavelet Basis, Fast Wavelet Transform.

Assessment	Formative assessment	Weekly exercises will be discussed to give feedback for student's learning.
	Summative assessment	Examination: 60%
		Coursework: 40% - Two (2) tests (30%) - One (1) assignment (10%)