

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		
<b>Aims</b> 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.			
<b>Learning Outcomes</b> <i>On successful completion of this module, a student will be expected to be able to:</i>			
Lower order :	40%	- understand the best approximation in inner product space - understand the method of interpolation using natural cubic spline, B-splines and radial basis functions - understand Wavelets and its application to signal and image processing	
Middle order :	40%	- develop and analyse several algorithms for computing approximation of functions	
Higher order:	20%	- 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	
<b>Module Contents</b> <ul style="list-style-type: none"><li>- Introduction: Norms, Normed linear spaces, Weierstrass Theorem.</li><li>- 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.</li><li>- Interpolation: Interpolating Polynomial, Runge’s Interpolation, Cubic Splines, Minimum Norm Interpolant, Computation of Natural Cubic Spline, and Interpolation with Radial Basis Functions.</li><li>- Topics in Computer Aided Geometric Design: Cubic Bezier Curves, Cubic B-spline Curves.</li><li>- Wavelets: Multiresolution Analysis, Orthogonal Splitting and Wavelet Basis, Fast Wavelet Transform.</li></ul>			
Assessment	Formative assessment	Tutorial and feedback.	
	Summative assessment	Examination: 60%	
		Coursework: 40% <ul style="list-style-type: none"><li>- 2 tests (30%)</li><li>- 1 assignment (10%)</li></ul>	