

Module Code	MA1022	Title	Mathematical Methods			
Credits	03	Hours/ Week	Lectures	03	Prerequisites	MA1012
			Lab/Tutorial	01		
Learning Objectives						
<ul style="list-style-type: none"> To apply the knowledge gained on calculus and algebra using Numerical Analysis and Differential Equations. To develop the basic Multivariate Function and Calculus concepts. To develop the basic concepts of Statistics. 						
Learning Outcomes						
<ul style="list-style-type: none"> Understand the basic concepts of Numerical Methods. Able to solve Ordinary Differential Equations. Acquire the concepts of Multivariate Function and Calculus. Acquire the concepts of Distributions for Statistical Applications. 						
Outline Syllabus						
<u>Numerical Methods</u>						
Approximations by Taylor Series, Numerical Solution of System of Linear Equations: Non Iterative Methods: Gauss Elimination, LU Factorization; Iterative Methods: Gauss-Seidel and Jacobi Methods; Solution of Non-linear Equations: Bisection, Simple Iterative, Newton-Rapson; Polynomial Approximation of Functions: Lagrange Polynomials, Newton's Divided Differences, Least Square Polynomial and Functions, Finite Differences, Interpolation and Extrapolation, Numerical Differentiation, Numerical Integration: Trapezoidal, Simpson's Rules, Numerical Solution of Ordinary Differential Equations: Euler's Method, Taylor Series Method.						
<u>Ordinary Differential Equations</u>						
Orthogonal Trajectories, Isoclines, First Order Ordinary Differential Equations; Variable Separable, Homogeneous, Linear and Exact; Reducible Forms, Second Order Ordinary Differential Equations, Reducible Forms.						
<u>Multivariate Calculus</u>						
Multivariable Functions, Partial Differentiation, Chain Rule, Change of Variables and Jacobians, Directional Derivatives, Maxima and Minima, Lagrange Multipliers, Taylor Series Expansion, Double Integral, Triple Integral, Geodesics, Vector Functions, Introduction to Vector Calculus.						
<u>Statistics</u>						
Discrete and Continuous Random Variables, Joint Distribution Functions, Introduction of Common Distributions and their application: Binomial, Poisson, Normal and Exponential. Measures of Central Tendency. Measures of Dispersion. Moments. Skewness. Kurtosis. Association between random variables: Pearson Correlation Coefficient, Rank Correlation Coefficient, Introduction of Bi-Varaite and Multivariate Distributions:						