**APPLIED MATHEMATICS**

**Course Code: GIS-114**

Credit hours: 2 (2+0)

Prerequisites: None

**Specific Objectives**

To abreast with basic concepts of Mathematics to prepare the students for carrying out planning data analysis and mathematical modeling.

**Content List**

* Pre-requisite: Algebra of complex numbers; Polar form of complex numbers; Algebra of matrices; Determinants and their properties; Crammer’s rule. Algebra of vectors; Scalar and vector products; Rules of differentiation; Techniques of integration
* Contents: Product and quotient of complex numbers in polar form; Properties of complex numbers; Logarithm of a complex number; De Moivres Theorem, The nth roots of a number; Solution of equations.
* A review of matrices, determinants and Crammer’s rule: Inverse of a matrix through elementary row operations; Solution of the system of linear equations; Eigenvalues and eigenvectors.
* Function and its different kinds; Inverse of a function; Graphs of some well-known functions; Continuous functions;
* A review of differentiation: Geometrical interpretation of a derivative; Infinitesimal; Differential coefficient; Derivatives of higher order; Indeterminate forms and L. Hopital’s rule; Asymptotes; Increasing and decreasing functions; Maxima and minima of a function; Directional derivatives.
* Further techniques of Integration; Integration by reduction formula; Fundamental Theorem of Integral Calculus; Definite integral and its properties; Area enclosed between curves; Arc length;
* Scalar and vector triple products. Scalar and vector point functions; Differentiation and integration of vector point functions.
* Formation of differential equations and solution of various types of first order differential equations.
* Cartesian, cylindrical and spherical coordinates; The ratio formula; Equations of a straight line in R3; Direction ratios and direction cosines; Angle between two straight lines, Distance of a point from a line; Equations of a plane; Angle between two planes; The sphere.

**Proposed Teaching Methodology**

* Lecturing
* Demonstration
* Use of related software

**Proposed Assessment (theory, 100%)**

 **Mid Term (40%)**

* Written long/short questions, quizzes etc

**Final Term (60%)**

* Written long/short questions, quizzes etc

**Recommended Books**

1. Wilson, A. G, *Mathematics for Geographers and Planners*, Oxford, Claredon, (Latest Edition)
2. Washington, J. Allyn, *Basic Technical Mathematics*, London; Banjamin, (Latest Edition).
3. Bhatti, M.I. and Nasir, M., *Mathematics for Engineers and Scientists*, Allied Book Centre, Urdu Bazar Lahore.
4. Kreyszig, E., *Advanced Engineering Mathematics*,John Wiley & Sons.
5. Spiegel. M.R.,*Vector Analysis*,McGraw – Hill Book Company.