Course Code	Course Title	Credit Hours
0541-13-115	Mathematics-I: Algebra, Geometry and Trigonometry	3.0

(a) Rational/Course Summary:

This course is designed to impart knowledge on mathematical logic, inequalities, algebraic series, theory of equations, complex number, group theory, geometry and trigonometry. The topics covered include: power series, which are used to formulate alternative representations of functions and are important in model building in chemistry; complex numbers and complex functions, which appear in quantum chemistry, spectroscopy and crystallography; matrices and determinants used in the solution of sets of simultaneous linear equations and in the representation of geometrical transformations used to describe molecular symmetry characteristics; and vectors which allow the description of directional properties of molecules. In chemistry, chemists use trigonometry when accurately describing the angles that are created when atoms bond together to form molecules in molecular geometry. Trigonometric functions, such as sine, cosine, and tangent, are essential to describe materials in their three dimensions

(b) Course Objectives

- To provide knowledge on the some fundamental mathematics like, algebra, geometry and trigonometry.
- To apply the theories and concepts on fundamentals of mathematics in chemistry.

(c) Course Contents

1.	**Elements of Logic:** Mathematical statements; Logical connectives; Conditional and bi-conditional statements; Truth tables and tautologies; Quantifications; Logical implication and equivalence; Deductive reasoning; The logic of relation
2.	**Inequalities:** Number Systems; Field and Order Properties of Real Numbers; Average Mean; Arithmetic Mean; Geometric Mean; Weierstras's Inequality; Cauchy-Schwarz Inequality; Tchebychef's and Holder's Inequalities.
3.	**Theory of Equations:** Equation and Identities; Basic Ideas of Solution of Equations with Graphical Representations; Relation Between Roots and Coefficients of the nth degree equations; Synthetic division. Position of Roots; Multiplicity of Roots; Transformation of Equations.
4.	**Series**: Basic Definition of Series; Techniques of Summing up Series; Tests of Convergence and Divergence of series; Method of Difference; Successive Difference Method.
5.	**Group Theory:** Main Classes of Group; Finite Group Theory; Lie Theory; Combinatorial and Geometric Group Theory; Connection to Symmetry; Application of Group Theory in Chemistry and Material Science.
6.	**Trigonometry:** Complex Number System; Forms of Complex Numbers, Argand's Diagram; De-Moivre's theorem and its applications; Gregory's series; Summation of trigonometric series; Hyperbolic functions; Geometry of Sphere; Spherical Triangle: Polar Triangle; Cosine and Sine Formula.
7.	**Two dimensional geometry;** Cartesian and Polar coordinate and their Applications in Chemistry ; Transformation of Coordinates; Translation and Rotation of Axes; Invariants; Pair of straight lines; General equation of second degree and reduction to standard form; Identification of conic, Circles and System of Circles; Parabola; Ellipse; Hyperbola; Equations of Conics in Polar and Parametric Forms.
8.	**Three dimensional geometry**: Three Dimensional Coordinates; Rectangular; Cylindrical and spherical coordinates; Direction cosine & direction ratios of a straight line; Equation of Planes; Equations lines; Sphere; Conicoids; Paraboloid; Cylender