Mathematics (Basic)-I: Topics in Basic Mathematics

Faculty: FMS
Course Code: MTH102
Course Title: Topics in Basic Mathematics
Number of Credits: 3 (3+0+0)

Course objectives: To introduce some of the basic topics in mathematics to those who did not study mathematics in Classes XI and XII.

Minimum prerequisites for taking this course, if any: Class X pass with Mathematics

Course structure with units, if applicable:

UNIT I: Sets, Relations & Functions
Sets and their representations, Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Types of relations, Function as a special type of relation. Real valued functions, domain and range of these functions, type of functions.

UNIT II: Trigonometric and Inverse Trigonometric Functions
Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Identities related to sin2x, cos2x, tan2 x, sin3x, cos3x and tan3x.
Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

UNIT III: Permutations and Combinations
Fundamental principle of counting. Factorial n. (n!) Permutations and combinations, derivation of Formulae for nPr and nCr and their connections, simple applications.

UNIT IV: Arithmetic and Geometric Progression
Arithmetic Mean (A.M.), geometric mean (G.M.), relation between A.M. and G.M., Arithmetic progression (A.P.), Geometric Progression (G.P.), general term of a A.P. and G.P., sum of n terms of A.P. and G.P., infinite G.P. and its sum.

UNIT V: Coordinate Geometry of Two dimensions
Slope of a line, angle between two lines, various forms of equations of a line: parallel to axis, point -slope form, slope-intercept form, two-point form, intercept form, Distance of a point from a line.

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

UNIT VI: Coordinate Geometry of Three dimensions
Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points.

Reading suggestions:

1. Stroud, K.A. and Booth, D.J. (2017). Foundation mathematics. Bloomsbury Publishing.
2. Hall, H.S. (1897). Higher algebra, a sequel to Elementary algebra for schools, by HS Hall and SR Knight. Macmillan and Company**.**
3. Stroud, K.A. and Booth, D.J. (2020). Engineering mathematics. Bloomsbury Publishing.
4. Loney, S.L. (1897). The elements of coordinate geometry. Macmillan and Company.

Evaluation:

Mid-semester Written Examination: 40% Marks
End-semester Written Examination: 40% Marks
Quiz / Assignment/Presentation (oral / poster)/other: 20% Marks