Mathematics I

Course Title: Mathematics I
Course No: MTH117
Nature of the Course: Theory
Semester: I

Full Marks: 60 + 40
Pass Marks: 24+16
Credit Hrs: 3

Course Description: The course covers the concepts of functions, limits, continuity, differentiation, integration of function of one variable; logarithmic, exponential, applications of derivative and antiderivatives, differential equations, vectors and applications, partial derivatives and Multiple Integrals.

Course Objectives: The objective of this course is to make students able to

- understand and formulate real world problems into mathematical statements.
- develop solutions to mathematical problems at the level appropriate to the course.
- describe or demonstrate mathematical solutions either numerically or graphically.

Course Contents:

Unit 1: Function of One Variable (5 Hrs.)
Four ways of representing a function, Linear mathematical model**,** Polynomial, Rational, Trigonometric, Exponential and Logarithmic functions, Combination of functions, Range and domain of functions and their Graphs

Unit 2: Limits and Continuity (4 Hrs.)
Precise definition of Limit, Limits at infinity, Continuity, Horizontal asymptotes, Vertical and Slant asymptotes

Unit 3: Derivatives (4 Hrs.)
Tangents and velocity, Rate of change, Review of derivative, Differentiability of a function, Mean value theorem, Indeterminate forms and L'Hospital rule

Unit 4: Applications of Derivatives (4 Hrs.)
Curve sketching, Review of maxima and minima of one variable, Optimization problems, Newton's method

Unit 5: Antiderivatives (5 Hrs.)
Review of antiderivatives, Rectilinear motion, Indefinite integrals and Net change, Definite integral, The Fundamental theorem of calculus, Improper integrals

Unit 6: Applications of Antiderivatives (5 Hrs.)
Areas between the curves, Volumes of cylindrical cells, Approximate Integrations, Arc length, Area of surface of revolution

Unit 7: Ordinary Differential Equations (6 Hrs.)
Introduction, Introduction to first order equations Separable equations, Linear equations, Second order linear differential equations, Non homogeneous linear equations, Method of undetermined coefficients

Unit 8: Infinite Sequence and Series (5 Hrs.)
Infinite sequence and series, Convergence tests and power series, Taylor's and Maclaurin's series

Unit 9: Plane and Space Vectors (4 Hrs.)
Introduction, Applications, Dot product and cross Product, Equations of lines and Planes, Derivative and integrals of vector functions, Arc length and curvature, Normal and binormal vectors, Motion in space

Unit 10: Partial Derivatives and Multiple Integrals (3 Hrs.)
Limit and continuity, Partial derivatives, Tangent planes, Maximum and minimum values, Multiple integrals

Text Book

1. Calculus Early Transcendentals, James Stewart, 7E, CENGAGE Learning.

Reference Book

1. Calculus Early Transcendentals, Thomas, 12^{th} Editions, Addision Wesley.