Pandit Deendayal Energy University **School of Technology**

16MA 101T					MATHEMATICS I					
Teaching Scheme					**Examination Scheme**					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
3	**1**	**--**	**4**	**4**	**25**	**50**	**25**	**--**	**--**	**100**

Course Objectives:

- **To be able to work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal.**
- **To understand the meaning of the derivative in terms of a rate of change and local linear approximation and should be able to use derivatives to solve a variety of problems.**
- **To evaluate definite integral both as a limit of Riemann sums and as the net accumulation of a rate of change and use of integrals to solve a variety of problems.**
- **Analyse the physical significance of gradient, divergence and curl.**

UNIT I: Calculus for single variable **8 Hrs.**

Successive differentiation, Leibnitz theorem (without proof), Taylor's and Maclaurin's expansion of functions of single variable. Fundamental theorem of Integral calculus, Application of integrals to length, area, volume and surface area of revolution. **Curve Tracing:** Asymptotes, Cartesian, polar and parametric forms.

UNIT II : Calculus for Several variables **11 Hrs.**

Partial derivatives, Euler's theorem, directional derivative and gradient, Taylor's and Maclaurin's expansion of functions of several variables, Maxima and minima of functions of several variables, Lagrange's method of undetermined multipliers, Multiple Integrals – double and triple**,** Jacobian, Change of order of integration, change of coordinates, evaluation of area, volumes of solids, Mass, center of gravity and moment of inertia.

UNIT III: Infinite Series & Improper Integrals **11 Hrs.**

Convergence and divergence of Infinite series. Comparison test, D' Alembert's ratio test, Raabe's test, logarithmic test, Cauchy's root test. Alternating series; Leibnitz test, power series. Convergence of improper integrals, Beta and Gamma functions and its properties.

UNIT IV: Vector Calculus **10 Hrs.**

Scalar and Vector fields, Line and Surface Integrals, Gradient, Divergent and Curl, Green's Theorem and Stoke's theorem (without proof) with application and physical significance.

TOTAL **40 Hrs.**

Course Outcomes:

1. Understand: Know higher order derivatives of power, trigonometric, exponential, hyperbolic, logarithmic and inverse trigonometric functions.
2. Know the chain rule and use it to find derivatives of composite functions
3. Be able to use derivatives to find intervals on which the given function is increasing or decreasing
4. Find maxima and minima, critical points and inflection points of functions of two or more variables.
5. Able to sketch graphs of rational functions including finding asymptotes, tangents and normals to graphs of functions given in explicit, implicit and parametric forms
6. Evaluate the line and surface integrals using Green's, Stokes and Gauss divergence theorems.

Texts and References

1. Higher Engineering Mathematics, B. S Grewal, Khanna Pub., Delhi.
2. Calculus (5th Edition), James Stewart, Thomson (2003).
3. Higher Engineering Mathematics, R. K. Jain & S. R. K. Iyenagar
4. Thomas' Calculus, eleventh edition, Pearson.
5. E.Kreyszig, Advanced engineering mathematics (8th Ed.), John Wiley (1999)
6. Advance Engineering Mathematics, Michael D. Greenberg