SEMESTER – V

MJC-09: Multivariate Calculus

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The conceptual variations when advancing in calculus from one variable to multivariable discussions.

CO2: Inter-relationship amongst the line integral, double and triple integral formulations.

CO3: Applications of multi variable calculus tools in physics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.

MJC-09 : Multivariate Calculus (5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Functions of several variables, Limits and continuity, Partial derivatives, Euler's theorem, Higher order partial derivatives, Total differential and differentiability, Schwarz and Young's theorem, Chain rule.	12
2	Directional derivatives, Gradient, Maximal and normal property of the gradient, Tangent planes and normal lines, Level curves and surfaces, Gradient and Tangents to Level curves, Extrema of functions of two variables, Critical points, Saddle points, Method of Lagrange multipliers.	12
3	Double integrals in Cartesian and polar co-ordinates, area and surface area, Triple integrals, Volume by triple integrals, triple integrals in cylindrical and spherical coordinates, Change of variables in double and triple integrals.	14
4	Line integrals, Applications of line integrals: Mass and Work, Fundamental theorem for line integrals, Definition of vector field, Conservative vector fields, Divergence and curl.	12
5	Green's theorem- Tangential and Normal form, Evaluation of line integrals using Green's theorem, Surface integrals, Stokes' theorem, The Gauss divergence theorem.	10
	TOTAL	60

Book References:

1. Malik, S.C. & Arora, Savita (2017). Mathematical Analysis, New Age International Private Limited.
2. Strauss, Monty J., Bradley, Gerald L., & Smith, Karl J. (2007). Calculus (3rd ed.). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Delhi. Indian Reprint 2011.
3. Marsden, J. E., Tromba, A., & Weinstein, A. (2004). Basic Multivariable Calculus. Springer (SIE). First Indian Reprint.
4. George B. Thomas, Joel Hass, Christopher Heil, Maurice D. Weir, Thomas' Calculus, 14e Paperback, Pearson Education.
5. Prasad Lalji, Advanced Calculus, Paramount Publications, Revised Edition (2015).