Pandit Deendayal Petroleum University   School of Liberal Studies

20BSM104T					Calculus – II (Group A)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs. / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

➢ To provide basic understanding of calculus of several variables.
➢ To be able to obtain extreme values of multivariate function.
➢ To study the multiple integration, understand it geometrically and explore its applications.
➢ To use this basic course in upcoming courses in respective specializations in higher classes.

UNIT 1 FUNCTIONS OF SEVERAL VARIABLES   11 Hrs.

Functions of several variables, limit and continuity of functions of two variables. Partial differentiation, total differentiability and differentiability, sufficient condition for differentiability. Chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes.

UNIT 2 EXTREMA AND VECTORS   07 Hrs.

Extrema of functions of two variables, method of Lagrange multipliers, Definition of vector field, gradient, divergence and curl.

UNIT 3 MULTIPLE INTEGRALS   11 Hrs.

Double integration over rectangular region, double integration over non rectangular region. Double integrals in polar co-ordinates, Triple integrals, Triple integral over a parallelepiped and solid regions. Volume by triple integrals, cylindrical and spherical co-ordinates. Change of variables in double integrals and triple integrals.

UNIT 4 LINE, SURFACE AND VOLUME INTEGRALS WITH THEIR RELATIONSHIPS   11 Hrs.

Line integrals, Applications of line integrals: Mass and Work. Fundamental theorem for line integrals, conservative vector fields, independence of path. Green's theorem, surface integrals, integrals over parametrically defined surfaces. Stokes' theorem, The Divergence theorem.

                                                                            40 Hrs.

COURSE OUTCOMES:

On completion of the course, student will be able to
CO1 – Define Function of several variables along with the concept of its limit, continuity and derivative.
CO2 – Understand the basics of vector calculus.
CO3 – Apply the technique of finding multiple integral and their applications
CO4 – Analyze the applications of line integrals.
CO5 – Evaluate the extreme value of multivariate function.
CO6 – Appraise calculus of several variables and vector calculus to understand various problems of science and engineering.

TEXT/REFERENCE BOOKS:

1. E. Marsden, A. J. Tromba and A. Weinstein, Basic Multivariable Calculus, 1st ed., Springer (SIE), Indian Reprint, 1993.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, 9th ed., Addison-Wesley Publishing Company, 1998.
3. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus, 3rd ed., Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2007.
4. J. Stewart, Essential Calculus-Early Transcendentals – 2nd ed., Cengage Learning, 2013.
5. H. Anton, I. Bivens and S. Davis, Calculus, 7th ed., John Wiley and Sons (Asia), Pvt. Ltd., Singapore, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100   **Exam Duration: 3 Hrs**

Part A: 6 questions of 4 marks each   24 Marks
Part B: 6 questions of 8 marks each   48 Marks
Part C: 2 questions of 14 marks each   28 Marks