Syllabus:

Review of Riemann Integral, Lebesgue Measure; Lebesgue Outer Measure; Lebesgue Measurable Sets. Measure on an Arbitrary Sigma- Algebra; Measurable Functions; Integral of a Simple Measurable Function; Integral of Positive Measurable Functions.

Lebesgue's Monotone Convergence Theorem; Integrability; Dominated Convergence Theorem; Lp- Spaces. Signed Measures and the Hahn -Jordan Decomposition- Radon-Nikodym theorem and its applications. Differentiation and Fundamental theorem for Lebesgue integration Product measure; Fubini's theorem

Text books:

1. G. de Barra, Measure and Integration, 2nd Edition, New Age International publications, 2013. 2. H.L. Royden, Real Analysis, 3rd Edition, Prentice-Hall of India, 1995.

References:

1. W. Rudin, Real and Complex Analysis, Third edition, McGraw-Hill, International Editions, 1987.
2. Inder K. Rana, An Introduction to Measure and Integration, American Mathematical Society, 2005.
3. P. R. Halmos, Measure Theory, Van Nostrand, 1950.
4. D.L. Cohn, Measure Theory, Birkhauser, 1997.
5. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age International, 2006.

Code:MAT5204: Multivariable Calculus Prerequisites: Linear Algebra, Single variable Calculus	L	T	P	Credit
	4	1	0	4

Course Category	Core
Course Type	Theory
Course Objective	The objective is to enable the students to develop a clear understanding of the fundamental concepts of multivariable calculus and a range of skills such as the ability to compute derivatives using the chain rule, ability to set up and solve optimization problems involving several variables, with or without constraints, ability to set up and compute multiple integrals in rectangular, polar, cylindrical and spherical coordinates, allowing them to work effectively

	with the concepts.). This course also envisages to enable the students to understand the major theorems: the Green's, Stokes' and the Gauss' theorems of the course and some physical applications of these theorems.
Course Outcome(s)	Understand the basic concepts and know the basic techniques of differential and integral calculus of functions of several variables; Apply the theory to calculate the gradients, directional derivatives, arc length of curves, area of surfaces, and volume of solids; Solve problems involving maxima and minima, line integral and surface integral and understand the major theorems: the Green's, Stokes' and the Gauss' theorems of the course and some physical applications of these theorems. Develop mathematical maturity to undertake higher level studies in mathematics and related fields.

Syllabus:

Functions of several variables, Directional derivative, Partial derivative, Total derivative, Jacobian, Chain rule and Mean value theorems, Interchange of order of differentiation, Higher derivatives, Taylor's theorem, Inverse mapping theorem, Implicit function theorem, Extremum problems, Extremum problems with constraints, Lagrange's multiplier method.

Multiple integrals, Properties of integrals, Existence of integrals, iterated integrals, change of variables.

Curl, gradient, divergence, Laplacian. Cylindrical and spherical coordinates. Line integrals, surface integrals, Theorems of Green, Gauss and Stokes.

Text books:

1. C.H. Edwards Jr., Advanced Calculus of Several Variables, Academic Press,
1973. 2. Apostol T.M., Calculus-II - Part-2, Non-Linear Analysis

References:

1. Apostol T.M., Mathematical Analysis, Original Edition .
2. Apostol T.M., Calculus-II - Part-2,Non-Linear Analysis.

Code:MAT5205: Ordinary Differential Equations Prerequisites: Knowledge of ordinary differential equations of first order and second order	L	T	P	Credit
	4	1	0	4