

## VECTOR CALCULUS AND PROBABILITY STATISTICS

IV Semester								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
A5BS06	BSC	L	T	P	C	CIE	SEE	Total
		3	1	--	4	30	70	100
COURSE OBJECTIVES								
1. Evaluation of definite integrals using Beta and Gamma functions. 2. Verification of vector integral theorems. 3.The concepts of discrete and continuous random variables, probability distribution and density function. 4. The concept of correlation and regression to find covariance. 5. Evaluation of the given data for appropriate test of hypothesis and finding the variance.								
UNIT-I	BETA GAMMA FUNCTIONS AND VECTOR DIFFERENTIATION							
Beta- Gamma Functions and their Properties-Relation between them- Evaluation of improper integrals using Gamma and Beta functions. Scalar and vector point functions - Gradient, divergence, curl and their related properties -Solenoidal and irrotational vector point functions - Scalar potential function - Laplacian operator								
UNIT-II	VECTOR INTEGRATION AND VECTOR INTEGRAL THEOREMS							
Line integral - work done - surface integrals - volume integral - Vector integral theorems - Green's theorem in a plane - Stoke's theorem - Gauss divergence theorem (all theorem statements and their verification).								
UNIT-III	SINGLE RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS							
Basic definitions of probability, Random Variables – Discrete and Continuous. Probability distributions, mass function/ density function of a probability distribution- mathematical expectation,Mean, Variance. Binomial, Poisson & Normal distributions and their Properties.								
UNIT-IV	CORRELATION & REGRESSION AND SAMPLING DISTRIBUTIONS							
Coefficient of correlation, the rank correlation, Covariance of two random variables. Regression- Regression Coefficient, The lines of regression. <b>Sampling:</b> Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimation- Point estimation and interval estimation.								
UNIT-V	TESTING OF HYPOTHESIS							
<b>Testing of hypothesis:</b> Null hypothesis, Alternate hypothesis, type I & type II errors – critical region, confidence interval, Level of significance. One sided test, two sided test, <b>Large sample tests:</b> (i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances) (ii) Tests of significance of difference between sample S.D and population S.D. (iii) Tests of significance difference between sample proportion and population proportion &difference between two sample proportions. <b>SMALL SAMPLE TESTS:</b> Student t-distribution, its properties; Test of significance sample mean and population mean, difference between means of two small samples.								

Snedecor's F- distribution and its properties. Test of equality of two population variances. Chi-square distribution, it's properties, Chi-square test of goodness of fit.

**Text Books:**

1. Ervin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. 3. Probability and Statistics for Engineers and Sciences by Jay L. Devore, Cengage Learning

**Reference Books:**

1. Fundamentals of Mathematical Statistics by S.C. Guptha&V.K. Kapoor, S. Chand
2. Introduction to Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press

**COURSE OUTCOMES****At the end of the course, student will be able to:**

1. Evaluate of definite integrals using Beta and Gamma functions
2. Verify vector integral theorems.
3. Evaluate the discrete and continuous random variables, mathematical expectation of mean and variance.
4. Apply the concepts of correlation and regression to find covariance and sampling distribution of mean and variance.
5. Evaluate the given data for appropriate test of hypothesis.