

SEMESTER III
PROBABILITY DISTRIBUTIONS AND ESTIMATION

Units	Topics	Total Teaching Hours 50
I	<p>Continuous Probability distribution-I Transformation of continuous random variables. Distribution Function Technique, MGF Technique, & Use of Jacobin of Transformation, Uniform distribution – definition, C.D.F., Moments, MGF., Mean deviation, and standard examples. Normal Distribution, Definition, Examples – Normal Curve – Properties – Mode, Median, MGF, CGF, Moments, Mean Deviation & Additive Property- Points of inflexion of normal curve, Standard Normal Curve and its Properties – Area Property of S.N.D. standard problems. Fitting of normal distribution. Box Muller transformation, Normal probability plot.</p>	10
II	<p>Continuous Probability distribution-II Exponential Distribution (Single And Double Parameter)– Definition, Moments, MGF, C Gamma Distribution- Definition, MGF, CGF, Limiting form of gamma distribution. E Distributions (First Kind And Second Kind), Mean And Variance, Moments, stand problems. Weibull Distribution- Definition, Moments. Cauchy Distribution- Definit Moments. Interrelationship between (i) Exponential, Gamma and Weibull distributions. Beta I, Beta II and Gamma. Central Limit Theorem: DeMoivre's Laplace Theorem (with proof), Lindberg-L Theorem (statement) and the applications of central limit theorem. Chebyshev's Inequa (statement and proof), convergence in probability & distributions, weak law of large numb & its applications with examples.</p>	10
III	<p>Estimation Introduction, Parameter space, Point Estimation: Estimator and Estimate. Properties of these estimators – Unbiasedness, Consistency, Sufficient condition for consistency, Efficiency. Minimum variance unbiased estimators, Factorization theorem (Statement and proof discrete case only), Fisher information function, CR Inequality (with proof) and Standard Problems. Interval Estimation – Need and Meaning, Confidence Coefficient, Confidence Interval, Meaning of Pivotal Quantity. Large and Exact Sample Confidence Intervals for Mean and difference of Means, Proportion and difference between Proportion,</p>	12
IV	<p>Method of Estimation Maximum Likelihood Estimation and Methods Moment of Estimation – Properties of these methods(Without Proof)-Problems on Bernoulli, B.D. P.D., G.D , Exponential (Single Parameter)Beta-I(θ, 1) and Laplace , Uniform And Normal Distributions etc.</p>	8
V	<p>Multiple and Partial correlation: Tri-Variate Data, Yule's Notations Plane of Regression, Residuals, Properties of residuals, variance of residuals. Multiple regression coefficients, multiple and partial correlation coefficients, their properties and application. Generalization for n- variables.</p>	10

Books for Reference:

1. Gupta. S.C and Kapoor. V. K. (2014), *Fundamentals of Mathematical Statistics*, Sultan Chand publications.
2. Mukhopadhyay. P. (1996), *Mathematical Statistics*, Calcutta Publishing House.
3. Hogg. R. V. and Craig. A. T. (1978), *Introduction to Mathematical Statistics*. Amerind Publishing Company.
4. Goon. A. M., Gupta. M.K., Das Gupta. B. (1991), *Fundamentals of Statistics*, World Press, Kolkata.

PRACTICALS

1. Continuous Probability Distribution-I
2. Continuous Probability Distribution-II
3. Confidence Interval.
4. Estimation of parameter by likelihood method-I
5. Estimation of parameter by likelihood method-II
6. Estimation of parameter by the method of moments.
7. Multiple and Partial Correlation and Regression I
8. Multiple and Partial Correlation and Regression II

Third semester – Blue Print							
PROBABILITY DISTRIBUTIONS AND ESTIMATION							
Teaching Hours : 50							
Unit	Topics	Teaching Hours	Number of questions to be asked				
			2 Marks	5 Marks	10 Marks	Total Questions	Total Marks
I	Continuous Probability Distribution-I	10	2	2	1	5	24
II	Continuous Probability Distribution-II	10	1	1	1	3	17
III	Estimation	12	2	1	1	4	19
IV	Method of estimation	10	1	2	1	4	22
V	Multiple and Partial Correlation	08	1	2	1	4	22
Total questions			7	8	5	20	104
To be Answered			5	6	3	14	70

SEMESTER IV
SAMPLING DISTRIBUTIONS AND TESTING OF HYPOTHESIS

Units	Topics	Total Teaching Hours 50
I	<p>Test of Significance(Large Sample Test) Test of significance, Hypothesis, Simple Hypothesis, Composite Hypothesis, Null Hypothesis, Alternative Hypothesis, Type- I and Type-II Errors, Critical Region, and level of significance, One tailed and Two tailed test, Critical or Significant values, Procedure of testing of hypothesis, P- values. Test of significance for large samples, sampling of attributes, Test for single proportion, Test of significance for difference of proportion, Sampling of variables, Test of significance single mean, Test of significance for difference of means.</p>	8
II	<p>Exact Sampling Distributions Chi-Square Distribution: chi-square variate, derivation of the chi-square distribution, moments, m. g. f, c. g. f, mode, skewness of chi-square distribution, limiting form of chi-square distribution, additive property of chi-square variates, Standard problems, conditions for the validity of chi-square test. Student's-t Distributions: Definition, Derivation of student's t- distribution, Fisher's t distribution, definition and derivation constants of t-distribution, central moments of t-distribution, limiting form of t-distribution. Snedecor's- F Distribution: F-statistic, derivation, moments, mode of F-distribution, relation between t and F distribution, F and chi-square distribution.</p>	12
III	<p>Test of Hypothesis and LRT Most Powerful Test (MP Test), Uniformly Most Powerful Test (UMP Test), Neyman – Pearson Lemma (with proof), and its use in the construction of most powerful test. Standard examples for computation of size and power of a test, standard examples on NP lemma. Monotone Likelihood Ratio (MLR) Property. Construction of UMP tests for testing one sided hypothesis for distribution with MLR property. LRT large sample approximations to the distribution of the Likelihood Ratio Statistics (without proof). LRT for single mean and difference of means for Normal case.</p>	12
IV	<p>Non Parametric Tests Meaning need and advantages. One sample and two sample sign test, Mann Whitney U test, Wilcoxon signed rank test, run test for randomness, run test for two populations with examples. Kolmogorov- Smirnov test for single sample.</p>	8
V	<p>Sequential Probability Ratio Test Need for sequential tests. Wald's SPRT, graphical procedure of SPRT. Determination of stopping bounds. Construction of SPRT for Binomial, Poisson, Normal, Exponential distributions and approximate expressions for OC and ASN functions for binomial, Poisson, exponential and normal distributions.</p>	10

Books for Reference:

1. Rohatgi. V.K., 1984, *An introduction to probability theory and Mathematical statistics*, Wiley.
2. Gupta S.C. and Kapoor V.K. 2014, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons publications.
3. Hogg. R. V. and Craig. A.T., 1978, *Introduction to Mathematical Statistics*, Macmillan.
4. Goon. A. M., Gupta. M.K., Das Gupta. B., 1991, *Fundamentals of Statistics*, World Press, Kolkata.

PRACTICALS

1. Large Sample test
2. Chi-Square Test
3. t –Test and F – Test
4. Testing of Hypothesis I (MP test)
5. Testing of Hypothesis II (UMP test and power curve)
6. Non parametric Test I
7. Non parametric Test II
8. SPRT

Fourth semester – Blue Print							
SAMPLING DISTRIBUTIONS AND TESTING OF HYPOTHESIS							
Teaching Hours : 50							
Unit	Topics	Teaching Hours	Number of questions to be asked				
			2 Marks	5 Marks	10 Marks	Total Questions	Total Marks
I	Test of significance	8	2	2	1	5	24
II	Exact Sampling distribution	12	2	2	1	5	24
III	Testing of Hypothesis and LRT	12	1	2	1	4	22
IV	Non parametric Test	8	1	1	1	3	17
V	SPRT	10	1	1	1	3	17
Total questions			7	8	5	20	104
To be Answered			5	6	3	14	70