Semester	**THREE**
Paper Number	**HSTCR3052T**
Paper Title	**Sampling Distributions & Statistical Inference 1**
No. of Credits	**6**
Theory/Composite	**Composite**
No. of periods assigned	Th: 4 Pr: 3
Module	Single
Course description/ objective	*At the end of the course a student should be able to understand* o The notion of sampling distribution of a statistic o The importance of sampling distributions in Statistical Inference. o The basics of Testing of Hypotheses. o The basic principle underlying tests of significance with application to different distributions.
Syllabus	**UNIT1:** ***Introduction:*** Definitions of random sample, parameter and statistic, sampling distribution of a statistic and its standard error. Distributions of functions of random variables. Illustration through simple transformation and generating function technique. [8L] **UNIT 2**: ***Exact sampling distribution:*** Definition and derivation of p.d.f. of $\chi 2$ with n degrees of freedom (d.f.) using m.g.f., nature of p.d.f. curve for different degrees of freedom, mean, variance, m.g.f., mode, additive property and limiting form of $\chi 2$ distribution. [6L] Student's and Fishers t-distribution, Derivation of its p.d.f., nature of probability curve with different degrees of freedom, mean, variance, moments and limiting form of t distribution. [6L] Snedecore's F-distribution, Derivation of p.d.f., nature of p.d.f. curve with different degrees of freedom, mean, variance and mode. Distribution of $1/F(n_1,n_2)$. Relationship between t, F and $\chi 2$ distributions. [5L] Sampling distributions of sample mean and sample variance when parent population is normal. Null distribution of sample correlation coefficient (statement only). [3L] **UNIT 3:** ***Testing and Confidence Intervals:*** Null and alternative hypotheses, level of significance, Type I and Type II errors, their probabilities and critical region. Tests of significance and confidence intervals based on χ_2 , t and F distribution when samples are generated from Univariate

	and Bivariate normal population (s). [12L] Exact tests relating to Binomial proportion (s) and Poisson mean (s). [4L] **UNIT 4:** ***Order Statistics:*** Introduction, distribution of the rth order statistic, smallest and largest order statistics. Joint distribution of rth and sth order statistics, distribution of sample median and sample range. [8L]	
List of Practical	1. Testing of significance for single proportion and difference of two proportions. 2. Testing of significance for single Poisson mean and difference of means of two independent Poisson distributions. 3. Testing of significance and confidence intervals for single mean and difference of two means and paired tests. 4. Testing if the population variance has a specific value and its confidence intervals 5. Testing of significance and confidence intervals of correlation coefficient. 6. Testing of equality of population variances for two independent normal populations and related confidence intervals. 7. Testing of ratio of variances for bivariate normal population and related confidence interval.	
Reading Reference List	1. Goon, A.M. Gupta, M.K. and Dasgupta, B. (2003): An outline of Statistical Theory, Vol. 1, 4th Edn.World Press, Kolkata. 2. Rohatgi V.K. and Saleh, A. K. Md , E. (2009): An Introduction to Probability and Statistics, 2nd edition (Reprint), John Wiley and Sons. 3. Hogg, R.V. and Tanis, E.A. (2009): A Brief Course in Mathematical Statistics. Pearson Education. 4. Johnson, R.A. and Bhattacharya, G.K. (2001): Introduction to the theory of Statistics, 3rd edition (Reprint). Tata McGraw-Hill Pub. Co. Ltd.	
Evaluation	**Theory** CIA: 10 End-Sem: 50 Total: 60	**Practical** Continuous assessment: 40
Paper Structure for End Sem Theory	Short questions (5 marks each)	Long questions (15 marks each)
	4 out of 6	2 out of 3