Semester	**Seven**
Course	**Minor**
Paper Code	
Paper Title	**Statistical Inference**
No. of Credits	**4**
Theory/Composite/ Practical	**Composite**
Minimum No. of preparatory hours per week a student has to devote	**3 Theory+ 2 Practical**
Number of Modules	**1**
Syllabus	**Unit 1:** ***Point Estimation***: Estimator and Mean Squared Error. Unbiasedness and Minimum Variance. Consistency. Sufficient conditions for consistency (statement only). Methods of Estimation : Method of Moments and Method of Maximum Likelihood. [12L] **Unit 2:** ***Testing of Hypotheses***: Null and Alternative Hypotheses. Simple and Composite Hypotheses. Test Statistic and Critical Region. Type I and Type II errors. Level of significance and size. Power of a test. p-value. Tests for mean and variance of a normal population. Tests for difference of means and ratio of variances of two independent normal populations. Tests for correlation coefficient, difference of means and ratio of variances of a bivariate normal population. [12L] **U** **3**: ***Large Sample Tests:*** Tests for a single and two independent binomial proportions. Pearsonian χ^2 and its uses in goodness of fit (parameters specified and unspecified), test of independence and test of homogeneity in contingency tables. [8L] **Unit 4:** ***Interval Estimation***: Confidence interval and confidence coefficient. Confidence interval for mean and variance of a normal population and difference of means and ratio of variances of two independent normal populations. Approximate confidence interval for single and two independent binomial proportions. Confidence interval for difference of means of a bivariate normal population. [7L]
Learning Outcomes	1. *Explain* the concepts of bias, mean square error, and consistency, and *apply* methods such as Method of Moments and Maximum Likelihood to *derive* efficient estimators. 2. *Formulate* null and alternative hypotheses, *implement* appropriate statistical tests, and *evaluate* results considering significance level, power, and error probabilities.

	3. *Apply* the Central Limit Theorem to large sample scenarios, *conduct* χ^2 tests for goodness of fit and independence, and *interpret* the results in context. 4. *Construct* and *interpret* confidence intervals for various population parameters.	
Reading/Reference List	1. Goon, A.M. Gupta, M.K. and Dasgupta, B. (2003): An outline of Statistical Theory, Vol. 2, 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.	
List of Practical	1. Methods of Estimation. 2. Confidence interval for the parameters of a normal distribution (one sample and two sample problems). 3. Tests of hypotheses for the parameters of a normal distribution (one sample and two sample problems). 4. Approximate tests for binomial proportion(s) and related confidence interval. 5. Tests for goodness of fit, independence and homogeneity using Pearsonian chi-square statistic.	
Evaluation	Theory CIA: 15 Semester Exam: 45	Practical : 40 Continuous assessment
Paper structure for semester exam	Short Questions (5 marks each) 3 out of 5	Long Questions (15 marks each) 2 out of 3