**B.A/ B.Sc. COURSE IN STATISTICS (OPTIONAL)**
**(WITH EFFECT FROM : 2018-19)**

**THIRD SEMESTER: THEORY PAPER**

**Total: 50 Hours.**

## STTH-3: SAMPLING DISTRIBUTIONS AND NON PARAMETRIC TESTS

**Unit: 1.Sampling Distribution and Large Sample Tests**:

Definition of population, Sample, Parameter and Statistic. Sampling distribution of $\bar{x}$ and $s^2$ for sample from normal distribution. Central Limit Theorem (without proof). Definition of Null and Alternative Hypothesis, Critical region, Type-I and Type-II errors and level of significance.

Large sample tests: Large sample tests-for mean and difference of means, proportion and difference of proportions.

**10 Hours.**

**Unit: 2. Exact Sampling Distributions:**

Chi-square ($\chi^2$)–distribution: Definition, and derivation, Properties-moments, recurrence relation for moments and approximation to normal distribution. Independence of sample means and sample variances in random sampling from a normal distribution. Applications of $\chi^2$ - distribution.

**10 Hours.**

**Unit: 3 Student's 't' and Snedecore's 'F' distributions**:

Definition, and derivation Moments of student's t-distribution. Recurrence relation for moments, limiting form of t-distribution. Applications of t-distribution. Theorotical examples.F- distribution: Definition and derivation of F- distribution. Moments of F-distribution. Recurrence relation for moments. Applications of F - distribution. Statement of inter relationship between $\chi^2$, t and F –distributions.

**10 Hours**

**Unit:4. Non-parametric tests:**

Order statistics – distribution of maximum and minimum statistics. Need for non-parametric tests. Advantages and dis-advantages of non-parametric methods over parametric methods. Assumptions in non-parametric methods. Sign test for quantiles, Sign test based on paired observations, Wilcoxon signed rank test for one sample and paired samples. Comparison of the sign-test and Wilcoxon signed-rank test, Man-Whitney-Wilcoxon test, Wald-Wolfowitz run test, Median test , Run test for randomness, Test for independence based on Spearman's rank correlation coefficient.

**10 Hours.**

**Unit: 5. Multiple and Partial Correlation and Regression:**

Trivariate data, Yule's notation. Equation of the plane of regression. Residuals and their properties, residual variance. Multiple correlation and partial correlation coefficients. Derivations and their properties, standard examples.

**10 Hours**

**THIRD SEMESTER:**

**STPR-3: PRACTICAL PAPER.**

1. Applications of Chi-square distribution-I: Goodness of fit.
2. Applications of Chi-square distribution-II: Independence of attributes.
3. Applications of t-distribution.
4. Applications of F- distribution.
5. Non-parametric tests-I
6. Non-parametric tests-II
7. Partial and Multiple correlation-I
8. Partial and Multiple correlation-II
9. Large sample tests.

**Books for study:**


1. Gupta S.C and Kapoor V.K.: Fundamentals of Mathematical Statistics- Sultan Chand & Sons' publications.
2. Hogg .R.V.and Craig.A.T(1978):Introduction to Mathematical Statistics.-4/e Macmillan .
3. Mood.A.M.,Graybill.F A. and Boes D.C.(1974): Introduction to the Theory of Statistics. McGrawHill.
4. Mukyopadhyay.P. (1996) .Mathematical Statistics.-Kolkotta Publishing House.
5. Goon AM, Gupta M.K., Das Gupta.B.(1991): Fundamentals of Statistics Vol-I World Press Kolkatta..


**Books for Reference:**


1.Rohatgi.V.K. and A.K.Md.Ehsanes Saleh (2002):An introduction to probability theory and Mathematical Statistics. John Wiley.

2.Murry R.Speigel (1982): Theory & Problems of Statistics, Schaum's publishing Series.

3. P.G.Hoel (1971): Introduction to Mathematical Statistics, Asia publishing house.

4. Dudewicz EJ and Mishra S.N (1980): Modern Mathematical Statistics-John Wiley.