

**Indian Institute of Space Science and Technology, Thiruvananthapuram.**

**Department of Humanities**

**Name of the Course : Critical Theories & Statistical Techniques (3 credits)**

**Course Code : HSM 812**

**Faculty : Dr Lekshmi V Nair, Dr CS Shaijumon, Dr Ravi**

**Objectives**

To familiarize the Research Scholars to the use of statistics in research and the different statistical methods used in research. This paper is also open for Research Scholars from other departments of IIST, as a preparatory course in Mathematics for doing research and who has not taken Maths in their UG classes.

**Outcome**

This course equips the students to understand the different statistical tools and software packages used in research.

**Course Content**

**1. Module 1: Introduction to Statistics**

Meaning and importance of Statistics, Scope of Statistics, **Population and Sample**, Nominal scale, ordinal scale, Variables : Interval scale, ratio scale, discrete and continuous variables, **Notion of a statistical population** : Finite population, infinite population, homogeneous population and heterogeneous population. **Notion of sample**, random sample and non-random sample. **Types of data** : (a) Primary data, Secondary data. (b) Cross-sectional data, time series data, failure data, industrial data, directional data. **Classification of data** : Raw data and its classification, Discrete frequency distribution, continuous frequency distribution, inclusive and exclusive methods of classification, Open end classes, cumulative frequency distribution and relative frequency distribution. **Editing and classification of Statistical Data**: accuracy & errors, classification and tabulation, **Graphical Presentation of Data** : Histogram, frequency curve, frequency polygon, Ogive curves, Stem and leaf chart. Check sheet, Pareto diagram

**2. Module 2: Measures of Central Tendency and Dispersion**

Statistical average, characteristics of a good statistical average, **Arithmetic Mean**: Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean, **Mode**: Definition, formula for

computation, graphical method of determination of mode, merits and demerits. **Median:** Definition, formula for computation graphical method of determination of median, merits and demerits. Empirical relation between mean, median and mode. **Measures of Dispersion:** Concept of dispersion, characteristics of good measure of dispersion. Range: Definition, merits and demerits. Semi-interquartile range (Quartile deviation). **Mean deviation:** Definition, merits and demerits, **Variance and standard deviation:** Definition, merits and demerits, effect of change of origin and scale, Measures of dispersion for comparison : coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation (C.V.)

### 3. **Module 3: Correlation and Regression**

**Correlation**, Bivariate data, bivariate frequency distribution. Concept of correlation between two variables- positive correlation, negative correlation, zero correlation. Scatter diagram, conclusion about the type of correlation from scatter diagram. Covariance between two variables: Definition, computation, effect of change of origin and scale. **Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient :** Definition, computation and interpretation, **Regression:** Concept of regression, lines of regression, fitting of lines of regression by the least squares method, interpretation of slope and intercept. Regression coefficient ( $b_{yx}$ ,  $b_{xy}$ ) : Definition, computation, properties, Residual plot and its interpretation. Explained and unexplained variation, Coefficient of determination. Non-linear regression

### 4. **Module 4: Hypothesis testing**

Introduction, need of hypothesis, meaning and types, Type I and Type II errors, confidence interval, procedure of testing hypothesis, Z, t, F and Chi-square tests, curve fitting and case studies, Use of Computer in Statistical Analysis (SPSS)

### 5. **Module 4:**

Basic probability concepts, Bayes Theorem, Important Probability distribution

### **Reading List**

1. Ackoff,R,L (1963)Design of Social Research, Chicago, University of Chicago Press.
2. Blalock, Huber. M. Social Statistics
3. Elanchce, d.L, Fundamentals of Statistics
4. Gupta, C. B, Introduction to Statistics
5. Gupta , S.P. (1984), Statistical Methods, Sulthan Chand & Sons Publication, New Delhi.
6. Weiss, Robert. S (1968), Statistics in social Research: An Introduction, New York, John Wiley & Sons.

7. Kurtz, Norman. R, Introduction to social Statistics

8. Levin, Jack, Elementary Statistics In Social Research 9. Lutz, Gene. M, Understanding Social Statistics

**Evaluation**

50 marks : End Sem Examination

30 marks : Quiz 1 and Quiz 2

20 marks : Assignment/ Viva Voce/ Seminar Presentation