

## **HONOURS COURSE STATISTICS**

### **Core Papers (Credit: 6 each) (14 papers)**

- STAT-C-101 Descriptive Statistics (Theory+ Practical)
- STAT C-102 Calculus
- STAT-C-201 Probability and Probability Distributions (Theory+ Practical)
- STAT C-202 Algebra
- STAT-C-301 Sampling Distributions (Theory+ Practical)
- STAT-C-302 Survey Sampling and Indian Official Statistics (Theory+ Practical)
- STAT C-303 Mathematical Analysis
- STAT-C-401 Statistical Inference (Theory+ Practical)
- STAT-C-402 Linear Models (Theory+ Practical)
- STAT-C-403 Statistical Quality Control (Theory+ Practical)
- STAT-C-501 Stochastic Processes and Queuing Theory (Theory+ Practical)
- STAT-C-502 Statistical Computing Using C/C++ Programming (Theory+ Practical)
- STAT-C-601 Design of Experiments (Theory+ Practical)
- STAT-C-602 Multivariate Analysis and Nonparametric Methods (Theory+ Practical)

### **Discipline Specific Elective Papers (Credit: 6 each) (4 papers to be selected)**

STAT-DSE-1 (Choose any one)

1. Operations Research(Theory+ Practical)
2. Time Series Analysis(Theory+ Practical)

STAT-DSE-2 (Choose any one)

1. Econometrics(Theory+ Practical)
2. Demography and Vital Statistics (Theory+ Practical)

STAT-DSE-3 (Choose any one)

1. Financial Statistics(Theory+ Practical)
2. Survival Analysis and Biostatistics(Theory+ Practical)

STAT-DSE-4 (Compulsory)

Project Work (Sixth Semester)

### **Skill Enhancement Electives (Credit: 2 each) (2 papers to be selected)**

STAT-SEE-1 (Choose any one)

1. Statistical-Data Analysis Using Software Packages
2. Data Base Management Systems

STAT-SEE-2 (Choose any one)

1. Statistical Techniques for Research Methods
2. Statistical Data Analysis Using R

### **Generic Elective Papers (GE) (Credit: 6 each) (4 papers of any discipline to be selected from other Departments/Disciplines)**

#### **Generic Elective Papers (GE) (Credit: 6 each)**

- STAT-GE-1. Descriptive Statistics and Probability Theory
- STAT-GE-2. Statistical Methods
- STAT-GE-3. Statistical Inference
- STAT-GE-4. Sample Surveys and Design of Experiments

## 1<sup>st</sup> Semester

### Core Papers in Statistics

#### STAT-C-101 Descriptive Statistics (Credit 6)

##### UNIT I

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and Sample, Data: primary, secondary, tertiary. quantitative and qualitative, attributes, variables, scales of measurement nominal, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram and ogives.

##### UNIT II

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis.

##### UNIT III

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation with properties (3 variables only), rank correlation. Simple linear regression, principle of least squares.

##### UNIT IV

Index Numbers: Definition, construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Marshall and Fisher's. Chain index numbers, conversion of fixed based to chain based index numbers and vice-versa. Consumer price index numbers.

##### SUGGESTED READING:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

##### PRACTICAL/LAB. WORK:

###### List of Practical

1. Graphical representation of data.
2. Problems based on measures of central tendency.
3. Problems based on measures of dispersion.
4. Problems based on combined mean and variance and coefficient of variation.
5. Problems based on moments, skewness and kurtosis.
6. Karl Pearson correlation coefficient.
7. Correlation coefficient for a bivariate frequency distribution.
8. Lines of regression, angle between lines and estimated values of variables.
9. Spearman rank correlation with and without ties.
10. Partial and multiple correlations.
11. Planes of regression and variances of residuals for given simple correlations.
12. Planes of regression and variances of residuals for raw data.
13. Calculate price and quantity index numbers using simple and weighted average of price relatives.
14. To calculate the Chain Base index numbers.
15. To calculate consumer price index number.

## **Core Papers in Statistics**

### **STAT C-102 – Calculus (Credit 6)**

#### **UNIT I**

Differential Calculus: Limits of function, continuous functions, properties of continuous functions, partial differentiation and total differentiation. Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions. Maxima and minima of functions of one and two variables.

#### **UNIT II**

Integral Calculus: Review of integration and definite integral. Differentiation under integral sign, double integral, change of order of integration, transformation of variables. Beta and Gamma functions: properties and relationship between them.

#### **UNIT III**

Differential Equations: Exact differential equations, Integrating factors, change of variables, Total differential equations, Differential equations of first order and first degree, Differential equations of first order but not of first degree, Equations solvable for x, y, q, Equations of the first degree in x and y, Clairaut's equations. Higher Order Differential Equations: Linear differential equations of order n, Homogeneous and non-homogeneous linear differential equations of order n with constant coefficients, Different forms of particular integrals.

#### **.UNIT IV:**

Formation and solution of a partial differential equations. Equations easily integrable. Linear partial differential equations of first order.

#### **SUGGESTED READINGS:**

1. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad (14<sup>th</sup> Edition - 1997).
2. Gorakh Prasad: Integral Calculus, Pothishala Pvt. Ltd., Allahabad (14<sup>th</sup> Edition -2000).
3. Zafar Ahsan: Differential Equations and their Applications, Prentice-Hall of India Pvt. Ltd., New Delhi (2<sup>nd</sup> Edition -2004).
4. Piskunov, N: Differential and Integral Calculus, Peace Publishers, Moscow.

## **Generic Elective**

### **STAT-GE-1 Descriptive Statistics and Probability Theory (Credit 6)**

Concepts of a statistical population and sample from a population, quantitative and qualitative data, nominal, ordinal and time-series data, discrete and continuous data. Presentation of data by tables and by diagrams, frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods). Measures of location (or central tendency) and dispersion, moments, measures of skewness and kurtosis, cumulants. Bivariate data: Scatter diagram, principle of least-square (concept only). Correlation and regression. Karl Pearson coefficient of correlation, Lines of regression, Spearman's rank correlation coefficient. Random experiment, sample point and sample space, event, algebra of events, Definition of Probability - classical, relative frequency and axiomatic approaches to probability, merits and demerits of these approaches (only general ideas to be given). Addition theorem, Theorem on conditional probability, independent events.

#### **Books Recommended**

1. J.E. Freund, *Mathematical Statistics with Applications*, 7th Ed., Pearson Education, 2009.
2. A.M. Goon, M.K. Gupta and B. Dasgupta, *Fundamentals of Statistics*, Vol. I, 8th Ed., World Press, Kolkatta, 2005.
3. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 11th Ed., Sultan Chand and Sons, 2007.

4. R.V. Hogg, A.T. Craig and J.W. Mckean, *Introduction to Mathematical Statistics*, 6th Ed., Pearson Education, 2005.
5. A.M. Mood, F.A. Graybill and D.C. Boes, *Introduction to the Theory of Statistics*, 3rd Ed., Tata McGraw Hill Publication, 2007.