

**The University of Burdwan**  
**Syllabus for B.Sc. General**  
**(1+1+1 Pattern)**  
**in**  
**Statistics**  
**with effect from 2014-2015**

**Part I Examination : Total marks = 100**

**Theoretical**

**100 marks**

**Paper I :**

**100 marks**

Group A : Descriptive Statistics

(50 marks )

Group B : Probability Theory and Theoretical Distributions

( 50 marks )

**Part II Examination: Total marks = 200**

**Theoretical**

**100 marks**

**Paper II:**

**100 marks**

Group A : Sampling Distribution and Point Estimation

(25 marks)

Group B: Economic Statistics and Time Series

(25 marks)

Group C: Testing of hypothesis and Confidence intervals

(25 marks)

Group D: Sample Survey methods I and Analysis of Variance

(25 marks)

**Paper III**

**Practical**

**100 marks**

**Practical I:** Based on topics from Paper I and Paper II Group A

(40 marks)

**Practical II:** Based on topics from Paper II excluding Group A

(40 marks)

Viva Voce:

(10 marks)

Practical Notebook:

(10 marks)

**Part III Examination : Total marks = 100**

**Theoretical**

**65 marks**

**Paper IV :**

**65 marks**

Group A:	Population Statistics and Statistical Quality Control	(30 marks)
Group B:	Sample Survey Methods II	(15 marks)
Group C:	Design of Experiments	(20 marks)

**Practical**

**35 marks**

**Practical III:** Based on topics in Paper IV

(25 marks)

Viva Voce:

(5 marks)

Practical Notebook:

(5 marks)

## Detailed Syllabus

**Paper I:** (100 marks)

**Group A:** (50 marks)

### **Descriptive Statistics**

Types of statistical data, Compilation, Classification, Tabulation and Diagrammatic representation of data, Frequency Distribution, Cumulative Distribution and their graphical representation, Histogram, Frequency Polygon, Frequency Curve and Ogive. (11L)

Analysis of Univariate Quantitative Data—concepts of central tendency, dispersion, relative dispersion, skewness and kurtosis and their measures based on quantiles and moments. (14L)

Analysis of Bivariate Quantitative Data—Scatter Diagram, Product Moment Correlation Coefficient and its properties, Regression Analysis, Fitting of Linear and Polynomial equations by the principle of Least Squares, Correlation Index, Correlation Ratio and Spearman's Rank Correlation Coefficient. (17L)

Analysis of Multivariate Quantitative Data – Multiple Regression, Multiple Correlation and Partial Correlation in *three* variables, their measures and related results. (8L)

### ***References:***

1. Goon A.M., Gupta M. & Dasgupta B.(2001) : Fundamentals of Statistics (Vol. 1), World Press
2. Yule G.U. & Kendall M.G.(1950) : Introduction to the Theory of Statistics, Charles Griffin
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Bhattacharyya G. K. & Johnson R. A. (1977): Concepts & Methods of Statistics, J. Wiley

**Group B:** (50 marks)

### **Probability and Theoretical Distributions**

Random Experiments and Random Events, Statistical regularity and meaning of Probability, Classical and Axiomatic definitions of Probability (discrete sample space only), Principal Theorems including union and intersection of events , Conditional Probability, Bayes Theorem and Independence of Events. (13L)

Random Variable and its Probability Distribution, Cumulative Distribution Function, Probability Mass Function and Probability Density Function, Mathematical Expectation, Variance and Moments. Joint Distribution of two random variables, Marginal and Conditional distributions, Covariance and Correlation, Simple Theorems including theorems on expectation and variance of a sum of random variables and expectation of product of random variables. (12L)

Standard Univariate Discrete Distributions and their properties—Discrete Uniform, Binomial, Poisson, Geometric distributions (9L)

Standard Univariate Continuous Distributions and their properties – Uniform, Normal, Exponential, Bivariate Normal distribution and statement of its general properties (9L)

Method of fitting of Binomial, Poisson and Normal distributions (2L)

Chebychev's Inequality, Weak Law of Large Numbers, Statement of Central Limit Theorem (i.i.d. case) and its uses. (5L)

**References:**

1. Goon A.M., Gupta M. & Dasgupta B.(1997): An Outline of Statistics(Vol 1), World Press
2. Feller W.(1968) : An Introduction to Probability Theory & its Applications, John Wiley
3. Cacoullous T. (1973): Exercises in Probability, Narosa
4. Bhattacharyya G. K. &Johnson R. A. (1977) : Concepts & Methods of Statistics, J. Wiley
5. Freund J.E. (2001): Mathematical Statistics, Prentice Hall
6. Pitman J. (1993): Probability, Narosa
7. Stirzaker D. (1994): Elementary Probability, Cambridge University Press
8. Rathie and Mathai: Probability and Statistics

**Part II Examination: Total marks = 200**

**Theoretical**

**100 marks**

**Paper II:**

**100 marks**

**Group A : Sampling Distribution and Point Estimation (25 marks)**

Concepts of Population and sample, Random Sampling and Sampling Distributions of Statistics. Sampling distribution of sum of independent Binomial and Poisson variables.  $\chi^2$ , t and F distributions (derivations excluded), sampling distribution of mean and variance of independent Normal variables. (13L)

Point Estimation of a population parameter– concepts of Bias and Standard Error of an estimator, concepts of Unbiasedness, Minimum Variance, Consistency and Efficiency of an estimator, Method of Moments, Maximum Likelihood Method of estimation, Method of Least Squares, Point estimators of the parameters of Binomial, Poisson, and univariate Normal distributions. (12L)

**References:**

1. Goon A.M., Gupta M. & Dasgupta B.(1997) : An Outline of Statistics (Vol 1), World Press
2. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 1), World Press
- 3.MoodA.M.,GraybillF. &Boes D.C.(1974):An Introduction to the theory of Statistics (3<sup>rd</sup> ed.), McGraw Hill
4. Rohatgi V.K. (1984): An Introduction to Probability Theory and Mathematical Statistics, John Wiley
5. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 1), World Press

**Group B: Economic Statistics and Time Series (25 marks)**

*Economic Statistics:* Index Number–construction and use of price index numbers and tests in connection with them, Consumer and Whole sale price index numbers, their uses and major steps in their construction. (12L)

*Time Series Analysis:* Different components of a times series, determination of Trend by method of simple moving- averages and by fitting mathematical curves by least squares principle, determination of seasonal indices by methods of trend ratios and ratios to moving averages. (13L)

**References:**

1. Goon A.M., Gupta M. & Dasgupta B.(2001): Fundamentals of Statistics (Vol 2), World Press
2. Yule G.U. & Kendall M.G.(1950) : Introduction to the Theory of Statistics, Charles Griffin
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Mukhopadhyay P. (1999): Applied Statistics
5. Croxton F. E., Cowden D. J. & Klein (1969) : Applied General Statistics, Prentice Hall

**Group C: Testing of Hypothesis and Confidence Intervals (25 marks)**

Statistical tests of Hypotheses– Null and Alternative hypotheses, Types of Errors, Critical Region, Level of Significance, Power and p-values, Exact tests of hypotheses under Normal set-up for a single mean, the equality of two means, a single variance and the equality of two variances, Test of Significance of sample correlation coefficient (null case) and tests of hypotheses for the equality of means and equality of variances of a bivariate Normal distribution. (13L)

Confidence Interval and Confidence Coefficient, Exact confidence interval under Normal set-up for a single mean, single variance, the difference of two means and the ratio of two variances. (5L)

Large Sample Tests and related Interval Estimates of a single mean and a single proportion and difference of two means & two proportions, Pearsonian  $\chi^2$  tests for goodness of fit, for homogeneity and for independence in a contingency table. (7L)

**References:**

1. Goon A.M., Gupta M. & Dasgupta B.(1997) : An Outline of Statistics (Vol 1), World Press
2. Goon A.M., Gupta M. & Dasgupta B.(2001): Fundamentals of Statistics (Vol 1), World Press
3. Mood A.M., Graybill F. & Boes D.C.(1974): An Introduction to the theory of Statistics(3<sup>rd</sup> ed.), McGraw Hill
4. Rohatgi V.K. (1984): An Introduction to Probability Theory and Mathematical Statistics, John Wiley
5. Goon A. M., Gupta M. & Dasgupta B. (2001): Fundamentals of Statistics (Vol 1), World Press

**Group D: Sample Survey Methods I and Analysis of Variance: (25 marks)**

**Sample Survey Methods I (15 marks)**

Concepts of population and sample, Need for sampling, Stages in the design and conduct of sample surveys. Concept of probability sampling, Random Number tables. Simple random sampling with and without replacement (15L)

**Analysis of Variance (10 marks)**

Analysis of Variance in one-way classified data and two-way classified data with equal number of observations in each cell. (10L)

**References:**

1. Goon A.M., Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 2), World Press
2. Cochran W.G. (1984): Sampling Techniques (3<sup>rd</sup>ed.), Wiley Eastern
3. Mukhopadhyay P. (1999): Applied Statistics

**Part III Examination: Total marks = 100**

**Theoretical**

**65 marks**

**Paper IV:**

**65 marks**

**Group A: Population Statistics and Statistical Quality Control**

**(30 marks)**

*Population Statistics :(15 marks)*

Vital events, Rates and Ratios, Measurement of Mortality–Crude, Specific and Standardized death rates, Complete Life Table, Measurement of Fertility and Reproduction–Crude Birth Rate, General, Specific and Total fertility rates, Gross and Net reproduction rates. (15L)

*Statistical Quality Control :(15 marks)*

Advantages of statistical quality control, Construction of control charts by attributes (np, p, c) and variables ( $\bar{x}$ , R). (9L)

Sampling Inspection Plan by attributes, OC, ASN (and ATI), LTPD and AOQL for single sampling plan (6L)

**References:**

1. Goon A.M., Gupta M. & Dasgupta B.(2001): Fundamentals of Statistics (Vol 2), World Press
2. Yule G.U.& Kendall M.G.(1950) : Introduction to the Theory of Statistics, Charles Griffin
3. Mukhopadhyay P. (1999): Applied Statistics
4. Croxton F. E., Cowden D. J. & Klein (1969) : Applied General Statistics, Prentice Hall

**Group B: Sample Survey Methods II**

**(15 marks)**

Stratified random sampling– associated unbiased estimators of population mean, total and proportion, their variances and unbiased variance estimators, Linear Systematic sampling, Two-stage sampling (with primary units of equal size and equal selection probability at each stage)–unbiased estimation of population mean and total. (15L)

**Group C: Design & Analysis of Experiments**

**(20 marks)**

Basic principles of design – Randomization, Replication and Local Control, Completely Randomized design, Randomized Block design and Latin Square design, applications of the technique of Analysis of Variance for the analysis of data collected under these designs. (20L)

**References:**

1. Goon A.M., Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 2), World Press
2. Kempthorne O.(1965): The Design & Analysis of Experiments, Wiley Eastern
3. Mukhopadhyay P. (1999): Applied Statistics.

