SYLLABUS FOR THE THREE YEAR

B.Sc.(General) COURSE

IN

STATISTICS

(Approved by the Under-Graduate Board of Studies)

West Bengal State University

(Barasat, NORTH 24 PARGANAS)

With Effect From The

ACADEMIC SESSION 2008-2011

Course Structure

Part I Examination : Total marks -100
(Theoretical 100 marks)

Theoretical – 100 marks

Paper –I: Full marks -100
Group -A : Probability Theory (50 marks)
Group –B : Descriptive Statistics (50marks)

Part II Examination : Total marks -200
(Theoretical 100 marks + Practical 100 marks)

Theoretical –100 marks

Paper- II : Full marks -100
Group –A : Sampling Distributions and Statistical Inference (50 marks)
Group –B : Sample Survey Methods and Design & Analysis of Experiments (50 marks)

Practical-100 marks

Paper-III: Full marks-100
Internal Evaluation: Based on topics of paper I & II (80 marks)
External Assessment: Based on topics of paper I & II (20 marks)
Viva –Voce (10 marks)
Practical Note Book (10 marks)

Part III Examination : Total marks -100
(Theoretical 75 marks + Practical 25 marks)

Theoretical –75 marks

Paper IV(Section I) : Full marks -75 marks
Applied Statistics (75 marks)
Practical-25 marks

Paper IV (Section II) : Full marks- 25 marks

Internal & External Evaluation based on the topics of Paper IV (Section I) will be as per the existing university regulations.

Detailed Syllabus

(L Denotes lecture hours)

Paper –I

Group A ***: Probability and Probability Distributions*** :

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

(15L)

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 including theorems on expectation and variance of a sum of random variables and expectation of product of random variables.

(15L)

Standard Univariate Discrete Distributions and their properties – Discrete Uniform, Binomial, Poisson, Hypergeometric, Geometric Negative Binomial distributions.

(12L)

Standard Univariate Continuous Distributions – Uniform, Normal, Exponential,Gamma, Beta, and Lognormal distributions. Bivariate Normal distribution statement of its general properties.

(12L)

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

(6L)

Group B ***: Descriptive Ststistics :***

Types of statistical data, Compilation, Classification, Tabulation and Diagammatic representation of data. Frequency Distribution. Cumulative Distribution and their graphical representation .Histogram. Frequency Polygon. Frequency Curve and Ogive.

(12L)

Analysis of Univariate Quantitative Data – concepts of central tendency, dispersion, relative dispersion, skewness and kurtosis and their measures based on quantiles and moments, Fitting of Binomial, Poisson and Normal distributions.

(15L)

Analysis of Bivariate Quantitative Data -- Scatter Diagram, Product Moment Correlation Coefficient and its properties, Correlation Ratio, Regression Analysis, Fitting

of Linear and Polynomial equations by principle of Least squares, Correlation Index. Spearman's and Kendall's Rank Correlation Coefficients.

(17L)

Analysis of Multivariate Quatitative Data – Multiple Regression . Multiple Correlation and Partial Correlation in three variables , their measures and related results.

(10L)

Analysis of Categorical Data – Independence and Association Attributes. Measures of association for two- way classified data.

(6L)

References ;

1. Goon A.M., Gupta M. & DasGupta B. (1977) : AnOutline of Statistics (Vol.1) World Press.
2. Feller W. (1968) : An Introduction to Probability Theory & its Application. John Wiley.

3.Yule G.U. and Kendall M.G. (1950) : Introduction to the Theory Statistics, Charles Griffin.

4.Cacoullos T. (1973) : Exercises in Probability.Narosa.

5. Nagar A.L. & Das .R.K. (1976) : Basic Statistics.

6. Bhattacharya G.K. & Johnson R.A.(1977) : Concepts and Methods of Statistocs. John Wiley.

7.Freund J.E. (2001) : Mathematical Statistics, Prentice Hall.

8. Pitman J. (1993) : Probability, Narosa.

9.Stizaker D. (1994) : Elementary Probability,Cambridge University Press.

10. Goon A.M., Gupta M. & DasGupta B.(2001) : Fundamentals of Statistics (Vol 1) World Press.

11.Rathie and Mathai : Probability and Statistics.

Paper –II

***Group A** : Sampling Distributions and Statistical Inference* :

Sampling Distributions: Population and Sample. Random Sampling and Sampling Distributions of Statistics, Sampling distributions of sum of independent Binomial and Poisson variables, χ^2 , t and F distributions (derivations excluded),sampling distributions of mean and variance independent Normal variables.

(10L)

Statistical Inference: 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 and Maximum

Likelihood Method of estimation, point estimators of the parameters of Binomial, Poisson and Univariate Normal distributions.

(10L)

Staistical Hypotheses Testing – Null and Alternative hypotheses, Types of Errors, Critical Region, Level of Significance, Power and p- value, 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 simple correlation coefficient (null case) and tests of hypotheses for equality of two means and equality of variances of a bivariate Normal distribution.

(15L)

Confidence Interval Estimation – 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, Fisher's z-transformation and its uses. Pearsonian χ^2 tests for goodness of fit & for homogeneity and independence in a contingency table.

(10L)

Nonparametric Tests – Sign test, Wilcoxon test, Mann-Whitney, Run test and Median test.

(10L)

<u>Group B</u> : Sample Survey and design & Analysis of Experiments

Sample Survey: Concepts of Population and sample. Need for sampling. Stages in the design and conduct of Sample surveys.

(6L)

Concept of probability Sampling. Random Number tables.

(4L)

Simple random sampling with and without replacement. Stratified random sampling – associated unbiased estimators of population mean, total and proportion, their variances and unbiased variance estimators. Linear Systematic sampling. Cluster sampling. Two-stage sampling (with primary units of equal size and equal selection probability at each stage) – unbiased estimation of population mean and total.

(17L)

Ideas of Ratio and Regression methods of estimation in simple random sampling.

(3L)

Design and Analysis of Experiments : Analysis of Variance in one-way classified data and two-way classified data with equal number of observations in each cell.

(8L)

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

(12L)

Factorial Expeiments – main effects and interactions in 2^2 and 2^3 experiments, notions of confounding

(10L)

References :

1. Goon A.M., Gupta M. & DasGupta B. (1977) : AnOutline of Statistics (Vol.1) World Press.
2. Goon A.M., Gupta M. & DasGupta B.(2001) : Fundamentals of Statistics (Vol World Press.
3. Mood A.M., Graybill F.& Boes D.C.(1974) : An introduction to the theory of Statistics(3rd ed) McGraw Hill
4. Rohatgi V.K. (1984) : An introduction to the Probability Theory and Mathematical Statistics , John Wiley.
5. Cochran W.G. (1984) : Sampling Techniques (3rd ed), Wiley Eastern.
6. Kempthorne O. (1965) : The Design & Analysis of Experiments, Wiley Eastern.
7. Goon A.M., Gupta M. & DasGupta B.(2001) : Fundamentals of Statistics (Vol 2) World Press.

Paper IV (Section I)

Economic Statistics: Index Number – construction and use of price index numbers and tests in connection with them . Consumer and Wholesale price index numbers, their uses and major steps in their construction. Idea of National Income.

(15L)

Time Series Analysis : Different components of a time 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.

(15L)

Population Statistics: Vital events. Rates and Ratios. Measure of Mortality – Crude.Specific and Standardized death rates.Infant Mortality Rate.Complete Life Table, Measure of Fertility and Reproduction – Crude Birth Rate, General, Specific and Total fertility rates, Gross and Net reproduction rates.

(20L)

Statistical Quality Control : Advantages of statistical quality control, construction and use of control Charts for mean, R , number of defectives d , p and number of defects c ,concepts of Sampling Inspection Plan by attributes, OC,ASN (and ATI). LTPD and AOQL for single sampling plan, use of IS 2500 – Part I.

(20L)

Indian Statistical System : The Statistical System in India – The Central and State Government Organizations. Activities of CSO and NSSO, sources of official statistics relating to Population, Agriculture, Price, Trade and Industry.

(10L)

References :

1. Goon A.M., Gupta M. & DasGupta B.(2001) : Fundamentals of Statistics (Vol 2) World Press
2. Yule G.U. & KendallM.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 : Applied General Statistics, Prentice Hall.
6. C.S.O. (1984) : Statistical System in India.