INTERNATIONAL COLLEGE FOR GIRLS
SFS, GURUKUL MARG, MANSAROVAR, JAIPUR

DEPARTMENT OF STATISTICS

REVISED COURSES OF STUDY

FOR

B.Sc./ B.A./ B.A.(H)(Subsi.) APPLIED STATISTICS EXAMINATION

III Semester Examination November 2008
IV Semester Examination April 2009
V Semester Examination November 2009
VI Semester Examination April 2010
Objective:
To understand the concept of sampling and sampling distributions and its applications.

Unit I

Unit II
Large Sample Test of Significance: Sampling for attributes and variables, tests of significance for single mean, standard deviation and proportions, tests of significance for difference between two means, standard deviations and proportions.

Unit III
Chi-square Distribution: Definition, Derivation, Moments, Moment Generating Function, Cumulant Generating Function, Mode and Skewness. Limiting and Additive property of Chi-square variate. Distribution of ratio of $\chi^2$ variates. Applications: Chi-square test for testing normal population variance, Test for goodness of fit, Contingency table and Test for independence of attributes, Yates correction for 2x2 contingency table.

Unit IV
t-Distribution: Definition of Student’s-t and Fisher’s-t statistics and derivation of their distributions. Limiting property of t-distribution. Applications: Testing of single mean, Difference of two means, paired t-test and sample correlation coefficient.

Unit V

Books Recommended
Essential readings
Reference Books

Objective:
This paper is focused on the study of different statistical techniques in psychometric analysis and statistical quality control, which involves the techniques for maintaining and improving the quality of products.

Unit I
Statistical Method in Psychology and Education - I: Types of scales: Nominal, Ordinal, Ratio and Interval, scaling of difficulty. Scaling of scores: Z-score, standard score, normalized score, T-score, Percentile score.

Unit II

Unit III
Demand Analysis: Demand and supply, law of demand and supply. Elasticity of demand: Price, Income and Cross elasticity. Engel’s curve and Engel’s law, Pareto’s law of income.

Unit IV
Statistical Quality Control -I: Concept of SQC, process control. Causes of variation in quality, general theory of control charts, control limits, sub-grouping, summary of out of control criteria.

Unit V
Product Control
Sampling Plan: Acceptance Sampling for Attributes, Concept of Single and Double Sampling Inspection plans.

Books Recommended
Essential Readings
**Reference Books**

1) Test of Significance:
   a) Large sample tests for mean and proportions for one and two sample problems.
   b) Chi-square test for variance, goodness of fit and independence of Attributes.
   c) t-test for mean and difference of means (paired and unpaired cases and for correlation coefficient).
   d) F-test for equality of population variances.
   e) Use of Z-transformation.
2) Control Charts:
   a) X, R and s-chart.
   b) p and np - chart for equal & unequal sample sizes.
   c) c-chart.

Note: Practical exercises will be conducted on computer by using MS-Excel.
Paper code: STT-401
Max. Marks: 100
Credit: 3
Periods/week: 3 hrs/week
Contact hrs/semester: 45 hrs/semester

Objective:
This paper is designed to familiarize the students with the concept of statistical inference which include estimation theory, testing and Non-Parametric Inference.

Unit I
10 Hours

Unit II
8 Hours
Methods of point estimation: Method of Maximum Likelihood and properties of MLEs (without proof). Methods of Moments, Minimum Chi-squares and Least Squares.

Unit III
9 Hours
Interval Estimation: Concept, confidence interval, confidence coefficient, construction of confidence interval for population mean, variance, difference of population mean when standard deviation are known and unknown and ratio of variances of Normal Distribution.

Unit IV
9 Hours
Statistical Hypothesis: Definition, Simple and Composite hypotheses, Null and Alternative Hypotheses, Types of errors, level of significance, Power and size of the test, and critical region Neyman Pearson Lemma and its application for finding BCR. BCR in case of Binomial, Poisson, Normal and Exponential Populations.

Unit V
9 Hours
Non Parametric Tests: Definition, merits and limitations, Sign test for univariate and bivariate distributions, Run test and Median test for small and large samples.

Books Recommended
Essential readings
Reference Books

B.Sc./B.A./B.A(H)(Subsi.)  
Semester IV  

Paper : Statistical Applications in Society and Industry

Paper code: STT-402  
Max. Marks: 100  
Credit: 3  
Periods/week: 3 hrs/week  
Contact hrs/semester: 45 hrs/semester

Objective:
This paper is focused on the study of Vital statistics, Index numbers and Time Series. Vital Statistic deals with laws of human mortality, morbidity and fertility. Role of index number is in formulation of executive decisions. In Time series analysis we will study about different trends and various methods useful in the determination of trends.

Unit I  
10 Hours  

Unit II  
8 Hours  

Unit III  
10 Hours  
Index Number – I: Meaning and uses of index numbers, problem in the construction of index numbers, price relatives, quantity and value relatives. Fixed base and chain base index numbers, use of averages. Weighted and unweighted index numbers- Laspeyers, Paasche’s, Marshall- Edgeworth and Fisher’s ideal index numbers, Dorbish, Kelly’s fixed base index numbers.

Unit IV  
8 Hours  

Unit V  
9 Hours  
Time Series Analysis: Definition and its different components, additive and multiplicative models. Different methods of determining trend and seasonal fluctuations, their merits and demerits.

Books Recommended

Essential readings
**Reference Books**

B.Sc./B.A./B.A.(H)(Subsi.)
Semester IV
Paper: Practical Paper

Paper code: STT-403
Max. Marks: 100
Credit: 2
Periods/week: 4hrs/week
Contact hrs/semester: 60 hrs/semester

1) Vital Statistics:
   a) CDR, CBR, Age specific death rates, standardized death rates.
   b) GFR, ASFR, TFR.
   c) Crude rate of natural increase GRR, NRR.
   d) Life table and finding out certain values with its help.

2) Economic Statistics:
   a) Laspeyres, Paasche’s and Fisher’s Index Numbers.
   b) Fixed base and chain base index number.
   c) Cost of Living Index Numbers.

3) i) Measurement of Trend by method of:
    a) Moving Averages.
    b) Curve fitting by least squares.
   ii) Measurement of seasonal fluctuations:
    a) Ratio to Trend
    b) Ratio to Moving Averages.
    c) Link Relative Method.

4) Non-Parametric Tests: Sign, Run, Median Tests (for large samples).

Note: Practical exercises will be conducted on computer by using MS-Excel and SPSS.
Objective:
This paper is aimed at teaching the students various sampling techniques and their application in different domains.

Unit I 7 Hours
Concept of population and sample, need for sampling, census and sample surveys. Advantages of sample survey over complete enumeration. Principal steps in a sample survey.

Unit II 8 Hours
Principles of Sample survey, Sampling and Non-sampling errors. Probability and Non-probability Sampling, Concept of Sampling Design Method of drawing a random sample from a finite population, accuracy and precision of an estimator.

Unit III 10 Hours

Unit IV 10 Hours

Unit V 10 Hours
Systematic Sampling and its advantages and disadvantages, variance of the estimated mean, comparison of systematic sampling with Simple and Stratified Random Sampling. Cluster Sampling with equal size clusters and its advantages and disadvantages, estimation of population mean. Variance and variance estimator of the estimated population mean.

Books Recommended
Essential readings
Reference Books
Objective:
This paper aims at teaching the students various optimization techniques and to introduce them with the concept of operational research.

Unit I
9 Hours
Linear Programming: Solution of system of linear equations, concept of basis, basic feasible solutions, convex sets and extreme points. Definition of General L.P.P., formulation problems of L.P.P., examples of L.P.P., Graphical Method of solving L.P.P.

Unit II
9 Hours

Unit III
9 Hours
Transportation Problem: North West Corner rule, Least-Cost method, and Vogel’s approximation method(VAM) to find the starting solution (initial basic feasible solution). Procedure to find the optimal solution. Assignment problem

Unit IV
10 Hours
Introduction to Computers-basic components, memory and information storage, bytes and words, binary number system, character representation codes. Introduction to data communication.

Unit V
8 Hours
Introduction to Operating System, Windows and its features, Windows Explorer and Control Panel, Display Properties, Desktop and its features, files and folders. Introduction and concept of MS-DOS, important terms in DOS( program file, directory, names, volume label, disk drive and its name, MS-DOS prompt), DOS file system, Various commands (Internal and External).

Books Recommended
Essential readings
3) Bhatia, Leena and Jain, Bindu: Elementary Computer Application, Swati Publication

Reference Books
Paper code: STT-503  
Max. Marks: 100  
Credit: 2  
Periods/week: 4 hrs/week  
Contact hrs/semester: 60 hrs/semester

1) Sample Surveys: To draw a simple random sample (SRS) with & without replacement to obtain an estimate of the population mean along with estimate of their variances. To compare the efficiency of SRSWOR with respect to SRSWR.

2) To draw all the possible samples by SRS – technique and to show that expected value of the sample mean equals the population mean and to show the expected value of sample mean square is population mean square.

3) Stratified Sampling:  
   i) Estimate the sample sizes by proportional allocation and Neyman’s Optimum Allocation.  
   ii) Estimate the mean of the population under the above scheme.  
   iii) Calculation of the sampling variance.  
   iv) Computation of relative efficiencies of the allocation scheme among themselves as well as with SRS.

4) Systematic Sampling and its comparison with SRS and Stratified Sampling.

5) Cluster Sampling

6) Linear Programming Problem  
   i) Graphical Method.  
   ii) Simplex Method (Big M and Two Phase).  
   iii) Duality in L.P.P.  
   iv) Degeneracy in L.P.P.

7) Transportation Problem  
   i) North-West Corner Rule  
   ii) Least- Cost Method  
   iii) Vogel’s Approximation Method.

8) Assignment Problem.

9) Problems based on Game Theory.

10) Practicals based on Unit V of AST-502.

Note: Practical exercises will be conducted on computer by using Analysis Tool Pack.
B.Sc./B.A./B.A(H)(Subsi.)
Semester VI
Paper : Analysis of Variance and Design of Experiments

Paper code: STT-601
Max. Marks: 100
Credit: 3
Periods/week: 3hrs/week
Contact hrs/semester: 45 hrs/semester

Objective:
This paper aims at teaching the students about Analysis of Variance and Design of Experiment.

Unit I
Analysis of Variance - I: Linear Model and its different types (only introduction). Concept of ANOVA (i). One-way classified data. (ii) Two-way classification with one observation per cell. Fixed effect models of (i) and (ii) and the assumptions involved. Effects of violation of assumptions made in ANOVA.

Unit II
Analysis of Variance – II: Estimation of treatment effects and treatment differences. Expectation of sum of squares, variance of the estimates for both one-way and two-way classified data and critical difference.

Unit III
Design of Experiments – I: Need for design of experiments, Meaning of experiment, experimental unit, treatment, field, block, experimental error, precision, uniformity trials. Fundamental principles of design of experiments- replication, randomisation and local control, Efficiency of design choice of size and shape of plots and blocks.

Unit IV
Design of Experiments – II: Basic designs (with one observation per cell and fixed effects model)- Completely Randomised Design, Randomized Block Design - Analysis of these designs, standard error of treatment differences, efficiency of RBD over CRD, their advantages, disadvantages and usages. Missing Plot Techniques, Estimation of single missing value in RBD

Unit V
Design of Experiments – III: Latin Square Design – Its analysis, least square estimates, expectation of sum of squares, efficiency of LSD over CRD and RBD. Estimators of single missing value in LSD. Factorial experiments- 2^2 experiments, main effects, interaction effects and their analysis.

Books Recommended
Essential readings

Reference Books
4. Mukhopadyay
Paper code: STT-602
Max. Marks: 100
Credit: 3
Periods/week: 3hrs/week
Contact hrs/semester: 45 hrs/semester

Objective:
This paper aims at teaching the students various computational techniques and the application of computers in statistics.

Unit I
8 Hours
Statistical software: Spread sheet- creating worksheet, use of various mathematical and statistical functions and creating various types of charts.

Unit II
9 Hours
Introduction to programming and programming languages, algorithm and flowchart for various problems. Introduction to C- programming, program structure, character set, data types, constants and variables, operators.

Unit III
10 Hours
Programming with ‘C’: Conditional statements, Branching and looping statements, arrays, mathematical and statistical problems like computation of mean, median, mode, standard deviation, correlation coefficient etc.

Unit IV
8 Hours
Arrays: Introduction to arrays, single dimensional array, two dimensional array, storing in and reading data from an array

Unit V
10 Hours
Introduction to user defined functions. Advantage of user defined function. Categories of function, definition, calling in a function. Scope and lifetime of variable.

Books Recommended
Essential readings

Reference Books
B.Sc./B.A./B.A(H)(Subsi.)
Semester VI
Practical Paper

Paper code: STT-603
Max. Marks: 100
Credit: 2
Periods/week: 4 hrs/week
Contact hrs/semester: 60 hrs/semester

1) Analysis of Variance and Design of Experiments:
   ii) One-Way and Two-Way classifications.
   iii) C.R.D.
   iv) R.B.D.
   v) L.S.D
   vi) Missing Plot Technique for one missing observation in R.B.D. and L.S.D.

2) Practical based on different constructs of C- language, which may include problems of paper AST-601.

3) One project based on statistical analysis of primary/secondary data collected by students, carrying 40 marks is also a component of this paper.

Note: Practical exercises will be conducted on computer by using MS-Excel and SPSS.