

THE FOLLOWING PART INCLUDES THE SYLLABI OF VARIOUS SEMESTERS OF B.Sc. / B.A. / B.Com. CLASSES AND ARE TO BE INCLUDED IN THE APPROPRIATE FOLDER.

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

STATISTICS (OPTIONAL)

B.A. / B.Sc. SEMESTER DEGREE COURSE IN STATISTICS

The revised syllabi at B.A. / B.Sc. degree course in respect of semester scheme spread over six semesters is implemented as under:

(1) Revised syllabi of Optional Statistics for B.A. / B.Sc. I & II Semester Course with effect from academic year 2013 -2014 onwards.

(2) Revised syllabi of Optional Statistics for B.A. / B.Sc. III & IV Semester Course with effect from academic year 2014 -2015 onwards.

(3) Revised syllabi of Optional Statistics for B.A. / B.Sc. V & VI Semester Course with effect from academic year 2015 -2016 onwards.

KARNATAKUNIVERSITY, DHARWAD

STATISTICS (OPTIONAL)

B.A. / B.Sc. DEGREE SEMESTER COURSE IN STATISTICS

ELIGIBILITY:

- (1) The students who have taken Mathematics at Pre-University level or at 12th standard under CBSE syllabi or at an equivalent course with mathematics as one of the subjects are eligible to offer this course.
- (2) Those who offer this optional statistics course at B.A. / B.Sc. course must take Mathematics as one of the optional paper.

General Instructions: (First to Fourth Semester)

1. The theory paper carries 80 marks and is of 3 hours duration.
2. The practical paper carries 30 marks. The journal carries 5 marks and viva-voce 5 marks. The practical examination is of 3 hours duration.
3. Journal marks will not be carried forward for subsequent examinations.
4. Students must complete all the practical exercises to the satisfaction of the teacher concerned.
5. Students must produce at the time of practical examination, the journal along with the completion certificate signed by the Head of the Department. Procedure of maintaining journal is same as in B.A. / B.Sc. I Semester Course.
6. There will be Internal Assignment marks for theory and practicals as per KarnatakUniversity rules and regulations. Theory paper carries 20 marks and internal practical examination carries 10 marks. The total marks for theory paper

is 100 and for practical examination is 50 including the internal assignment marks.

7. There will be 5 hours of lecturing per week for theory paper.
8. There will be 4 hours of practical work per week per batch.
9. The practical batches will be made as per the instruction of KarnatakUniversity, Dharwad and Department of Collegiate Education, Bangalore. However for conduct of practical examination, a batch shall not consist of more than 10 students per batch.
10. Use of simple calculators and scientific calculators is permitted during practical classes and during practical examination.

General Instructions :(Fifth & Sixth Semester)

1. There will be two theory papers and two practical examinations.
2. There will be two separate practical journals to be maintained in respect of two theory papers done during the year.
3. The each theory paper carries 80 marks and is of 3 hours duration.
4. The each practical paper carries 30 marks. The journal carries 5 marks and viva-voce 5 marks. The practical examination is of 3 hours duration.
5. Journal marks will not be carried forward for subsequent examinations.
6. Students must complete all the practical exercises to the satisfaction of the teacher concerned.
7. Students must produce at the time of practical examination, the journal along with the completion certificate signed by the Head of the Department. Procedure of maintaining journal is same as in B.A. / B.Sc. I Semester Course.
8. There will be Internal Assignment marks for theory and practicals as per KarnatakUniversity rules and regulations. Each theory paper carries 20 marks and

each internal practical examination carries 10 marks. The total marks for each theory paper is 100 and for each practical examination is 50 including the internal assignment marks.

9. There will be 3 hours of lecturing per week for theory paper.
10. There will be 4 hours of practical work per week per batch.
11. The practical batches will be made as per the instruction of Karnatak University, Dharwad and Department of Collegiate Education, Bangalore. However for conduct of practical examination, a batch shall not consist of more than 10 students per batch.
12. Use of simple calculators and scientific calculators is permitted during practical classes and during practical examination.

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. I Semester Course with effect from academic year 2013 -2014 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

FIRST SEMESTER THEORY PAPER

STTH: 1 BASIC STATISTICS, PROBABILITY & MATHEMATICAL EXPECTATION

Unit I: Introduction: Introduction, meaning, definition, functions, limitations, scope of statistics, variable, attribute, qualitative and quantitative data, types of data & scales of measurement (nominal, ordinal, interval, ratio, cross sectional, time series etc.), Formation of a uni-variate and bi-variate frequency distribution, marginal and conditional distributions, Graphical presentation of a frequency distribution.

(10 Hours)

Unit II: Uni-variate measures:

Measures of central tendency – Arithmetic mean, Geometric mean, Harmonic mean, Median & Mode. Definition, formulae, properties, merits and demerits, Measures of partition values – Quartiles, Deciles & Percentiles, definition, formulae, Measures of dispersion – Absolute & relative measures, Range, Quartile Deviation, Mean Deviation and Standard Deviation, definition, formulae, properties, merits and demerits, Measures of Skewness: Meaning, need, types of skewness, absolute and relative measures, properties, Measures of Kurtosis: Need, types of kurtosis, measurement of kurtosis, properties, standard theoretical examples. Moments about origin, moments about mean, their interrelationships, and properties.

(20 Hours)

Unit III: Probability Theory: Basic concepts: Random experiment, Sample space, Mutually exclusive, exhaustive, equally likely events, complimentary events, classical, statistical and axiomatic definition of probability, properties, Addition and Multiplication, Conditional probability theorems with proofs, theoretical examples, With replacement and without replacement selection, Independent and dependent events, Bayes' theorem and its applications.

(12 Hours)

Unit IV: Random Variables & Mathematical Expectations: Definition of a random variable, discrete & continuous, probability mass function, probability density function, distribution function and its properties, idea of marginal, conditional distributions, joint probability functions, independence of random variables. Mathematical expectation of a random variable. Addition theorem and Multiplication theorems on mathematical expectations.

(10 Hours)

Unit V: Generating functions and their applications: Moment generating functions, cumulants generating functions, probability generating functions, and its applications, theorems associated with MGF, Chebyshev's inequality and its applications, Weak Law of Large Numbers.

(8Hours)

LIST OF PRACTICALS FOR FIRST SEMESTER

STTH: 1 BASIC STATISTICS, PROBABILITY& MATHEMATICAL EXPECTATION

1. Formation of a frequency distribution uni-variate and bi-variate etc.
2. Graphical presentation of a frequency distribution
3. Measures of Central Tendency – I & II
4. Partition values
5. Measures of Dispersion – I & II
6. Measures of Skewness and Kurtosis
7. Probability – I & II
8. Exercise on Mathematical Expectation.

9. Exercise on Moments.

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for Study:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Kalyan Kumar Mukherjee: Probability and Statistics, New Central Book Agency (P) Ltd., Calcutta.
3. Bansilal & Arora, S.R.: Mathematics of Probability & Statistics, R. Chand & Co., New Delhi.
4. Chatterji, P.N.: Mathematical Statistics, Rajhans Prakashana Mandir, Educational Publishers, Meerut.
5. Ray & Sharma: Mathematical Statistics, Ram Prasad & Sons, Agra.
6. Dr. Goel, B.S., Prof. Satyaprakash and Dr. Roshan Lal: Mathematical Statistics, Pragati Prakashana, Meerut.

Books for reference:

7. Robert V. Hogg and Allen T. Craig: Introduction to Mathematical Statistics (Fifth Edition), Pearson Education Inc, New Delhi.
8. Goon, A.M., Gupta, M.K. and Dasgupta, B.: Fundamentals of Statistics Volume I and II. The World Press Private Limited, Calcutta.
9. Mathai, A.M.: Introduction to Statistical Methods, MacMillan Company Ltd,.
10. Lindgren: Introduction to Probability & Statistics, MacMillan Publishers.
11. Rohatgi, V.K.: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi.
12. Parzen: Modern Probability Theory & its Applications, Wiley Eastern.
13. A.M. Mood and Graybill: Introduction to the theory of Statistics.

***** End *****

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. II Semester Course with effect from academic year 2013 -2014 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

SECOND SEMESTER THEORY PAPER

**STTH: 2 CORRELATION & REGRESSION, PROBABILITY DISTRIBUTIONS, ORDER
STATISTIC.**

Unit I: Correlation and Regression: Definition, Types of correlation, Methods of measuring correlation, Scatter diagram, Prof. Karl Pearson's coefficient of linear correlation, its properties, Spearman's rank correlation coefficient, its properties, Kendall's correlation coefficient, Regression coefficients and Line of regressions, its properties Angle between two regression lines.

(12 Hours)

Unit II: Multiple & Partial Correlation and Regression: Idea of a tri-variate distribution, Yule's notations, Plane of regression and its derivation, Multiple and Partial correlation, Definition, derivation, and their standard properties. Properties of residuals, Analysis of simple linear regression and multiple regressions of three variables, Estimation and testing of parameters, Theoretical examples.

(12 Hours)

Unit III: Standard discrete distributions: Uniform, Bernoulli, Binomial, Poisson, Geometric, Negative Binomial, Hyper geometric distributions, definition, mean, variance, moments, moment generating functions, recurrence relation for probabilities and moments for binomial, Poisson, and Negative binomial distributions, additive property, Cumulant generating function, theoretical examples.

(15 Hours)

Unit IV: Standard Uni-variate continuous distributions: Rectangular, Beta, Gamma, and Exponential distributions, definitions through p.d.f's, Mean, variance, moments, recurrence relations, Additive property of exponential and gamma variates, Normal distribution and its properties, Cauchy distribution, Uni-variate and Bi-variate transformation of variables of discrete and continuous random variables.

(15Hours)

Unit V: Order statistics: Definition of ordered statistic and their distributions, Derivation of first order statistic, highest order statistic, r^{th} order statistics, joint distribution of order statistics and their derivations, simple examples to obtain the distributions of order statistics.

(06 Hours)

LIST OF PRACTICALS FOR SECOND SEMESTER

STTH: 2 PROBABILITY DISTRIBUTIONS, CORRELATION & REGRESSION, TIME SERIES

1. Correlation and Regression for two variables
2. Rank Correlation:
3. Multiple and Partial correlation:
4. Plane of regression.
5. Fitting of Binomial distribution.
6. Fitting of Poisson distribution
7. Fitting of Negative binomial distribution.
8. Exercise on computation of probabilities using discrete distributions.
9. Examples on probability calculations on normal distribution and use of standard normal tables.
10. Fitting of normal distribution.

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for Study and Reference:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Kalyan Kumar Mukherjee: Probability and Statistics, New Central Book Agency (P) Ltd., Calcutta.
3. Bansilal & Arora, S.R.: Mathematics of Probability & Statistics, R. Chand & Co., New Delhi.
4. Chatterji, P.N.: Mathematical Statistics, RajhansPrakashana Mandir, Educational Publishers, Meerut.
5. Ray & Sharma: Mathematical Statistics, Ram Prasad & Sons, Agra.

6. Dr. Goel, B.S., Prof. Satyaprakash and Dr. Roshan Lal: Mathematical Statistics, Pragati Prakashana, Meerut.

Books for reference:

1. Robert V. Hogg and Allen T. Craig: Introduction to Mathematical Statistics (Fifth Edition), Pearson Education Inc, New Delhi.
2. Rohatgi, V.K.: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi.
3. Lindgren: Introduction to Probability & Statistics, MacMillan Publishers.
4. Parzen: Modern Probability Theory & its Applications, Wiley Eastern.
5. A.M. Mood and Graybill: Introduction to the theory of Statistics.
6. Mathai, A.M.: Introduction to Statistical Methods, MacMillan Company Ltd, India.

***** End *****

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. III Semester Course with effect from academic year 2014 -2015 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

THIRD SEMESTER THEORY PAPER

STTH: 3: EXACT SAMPLING DISTRIBUTIONS & THEORY OF ESTIMATION

Unit I: Sampling distribution: Basic concepts – Population, Sample, Parameter, Statistic. Definition of a Random Sample, Sampling distribution of a Statistic and its standard Error. Statement of Central limit theorem: Derivation of Lindeberg & Levy Central Limit Theorem by MGF method, Simple examples.

(05 Hours)

Unit – II: Chi-Square Sampling Distribution:

Chi-square Distribution: Definition, Derivation of Chi-distribution by Moment Generating Function method, Properties, Moments, Recurrence relation for moments about origin and mean, limiting form of Chi- distribution. Independence of sample mean and sample variance in random sampling from a normal distribution, Theoretical examples.

(10 hours)

Unit – III: Sampling distributions of t and F:

Definition of students t – variate and Fisher’s t – variate, Derivation of students t – distribution, Moments and Recurrence relation for t – distribution, Limiting form of t – distribution, Theoretical examples. Snedecor’s F – distribution: Definition, Derivation of F – distribution, Properties, Moments and recurrence relation for moments, Interrelationship between t, F and χ^2 distributions, Theoretical examples.

(15 hours)

Unit – IV: Point Estimation:

Concepts of the terms: Parameter, Estimator, Estimate and Standard Error of an estimator. Unbiasedness, Mean squared error as a criterion for comparing estimators. Relative efficiency, Most efficient estimator, Minimum variance unbiased estimator (MVUE). Consistency: Definition and criteria for consistency. Proof of Sufficient condition

for consistency using Chebyshev's inequality. Sufficient statistic, Fisher – Neyman criterion and Neyman – Factorization theorem (without proof), Measure of information – Fisher information function. Cramer – Rao inequality (with proof) and its applications in the construction of minimum variance unbiased estimators. Methods of Estimation: Maximum Likelihood and Moment estimation methods. Standard examples from theoretical distributions, Illustration for non uniqueness of MLE's. Properties of MLEstimator and MMEstimator. Examples illustrating properties of MLE.

(20 hours)

Unit – V: Interval Estimation:

Meaning of confidence interval and pivotal quantity, Confidence interval based on pivotal quantity. Confidence coefficient. Confidence intervals for mean, difference between means for large and small samples, Confidence intervals for variance and ratio of variances under normality. Large sample confidence intervals for a proportion and difference between two proportions and correlation coefficient. (10hours)

LIST OF PRACTICALS FOR THIRD SEMESTER

STTH: 3: SAMPLING DISTRIBUTION, TEST OF SIGNIFICANCE & CONFIDENCE INTERVAL

1. Computation of mean square errors of estimators and comparison.
2. Maximum Likelihood Estimation – I
3. Maximum Likelihood Estimation – II
4. Method of Moment Estimation.
5. Confidence Intervals – I
6. Confidence Intervals – II

7. Confidence Intervals – III

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for Study:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Kalyan Kumar Mukherjee: Probability and Statistics, New Central Book Agency (P) Ltd., Calcutta.
3. Bansilal & Arora, S.R.: Mathematics of Probability & Statistics, R. Chand & Co., New Delhi.
4. Ray & Sharma: Mathematical Statistics, Ram Prasad & Sons, Agra.
5. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
6. Goon, A.M., Gupta, M.K. and Dasgupta, B.: Fundamentals of Statistics Volume I and II. The World Press Private Limited, Calcutta.

Books for reference:

1. Robert V. Hogg and Allen T. Craig: Introduction to Mathematical Statistics (Fifth Edition), Pearson Education Inc, New Delhi.
2. Rohatgi, V.K.: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi.
3. Lindgren: Introduction to Probability & Statistics, MacMillan Publishers.
4. Mathai, A.M.: Introduction to Statistical Methods, MacMillan Company Ltd, India.
5. Goon, A.M., Gupta, M.K. and Dasgupta, B.: Fundamentals of Statistics Volume I and II. The World Press Private Limited, Calcutta.

***** End *****

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. IV Semester Course with effect from academic year 2014 -2015 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

FOURTH SEMESTER THEORY PAPER

STTH: 4: TESTING OF STATISTICAL HYPOTHESIS

Unit – I: Tests of Significance:

Definitions of some important terms: Statistical Hypothesis, Simple & Composite, Null and Alternative hypothesis, Critical Region, Type I and Type II errors, Level of Significance, Power function and Power of the test, One tailed and Two tailed tests, Large sample test for mean and difference of means, Proportion and difference of proportions. Applications of χ^2 , t and F distributions.

(15 hours)

Unit –II: Testing of Hypothesis:

Definitions of Most powerful test, Uniformly most powerful test. Statement and proof of Neyman - Pearson Lemma and its use in the construction of most powerful test, Standard examples for computation of Type I and Type II errors and Power of the test. Standard examples for NP lemma to determine most powerful Critical Region for one sided and two sided alternatives, and for Power Curves. Idea of randomized and non – randomized tests and critical function.

(10 hours)

Unit III: Likelihood Ratio Test & MLR property:

Likelihood ratio tests (LRT). Large sample approximations to the distribution of the likelihood ratio statistics (without proof). LRT for single mean for normal case (large and small samples). Definition of a monotone likelihood ratio property, verification of the property for some standard distributions for existence of one sided UMP tests.

(10 hours)

Unit IV: Non –Parametric tests:

Need for Non-Parametric Tests, Advantages and Dis-advantage of non-parametric methods over parametric methods. Assumptions in non-parametric methods. Sign test for quantiles, Sign test based on paired observations, Wilcoxon signed rank test for one sample and paired samples. Comparison of the sign-test and Wilcoxon signed– rank test, Kolmogorov – Smirnov one-sample test, Comparison of it with chi-square test, Wald-Wolfowitz runs test, Median test and Mann-Whitney-Wilcoxon –test for two sample problems, Run test for randomness, Test for independence based on Spearman’s rank correlation coefficient.

(10 Hours)

Unit- V: - Sequential Testing:

Need for sequential tests, Wald’s SPRT, Graphical procedure of SPRT, Determination of stopping bounds, Construction of SPRT of strength (α, β) for Binomial, Poisson, Normal and Exponential distributions. Approximate expressions for OC and AS N functions for Binomial, Poisson and Normal distributions. Difference between SPRT and NP-test. Merits and demerits of SPRT.

(15 hours)

LIST OF PRACTICALS FOR FOURTH SEMESTER

STTH: 4: TESTING OF STATISTICAL HYPOTHESIS

1. Large Sample Tests.
2. Applications of Chi-square distribution.
3. Applications of Students t – distribution.
4. Applications of Snedecor’s F – distribution.
5. Testing of Statistical Hypothesis – I
6. Testing of Statistical Hypothesis – II
7. Non – Parametric Tests – I
8. Non – Parametric Tests – II
9. Sequential Probability Ratio Test – I
10. Sequential Probability Ratio Test – II

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for Study:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
 2. Ray & Sharma: Mathematical Statistics, Ram Prasad & Sons, Agra.
 3. Goon, A.M., Gupta, M.K. and Dasgupta, B.: Fundamentals of Statistics Volume I and II. The World Press Private Limited, Calcutta.
 4. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.
- Goon, A.M., Gupta, M.K. and Dasgupta, B.: Fundamentals of Statistics Volume I and II. The World Press Private Limited, Calcutta.

Books for reference:

1. Robert V. Hogg and Allen T. Craig: Introduction to Mathematical Statistics (Fifth Edition), Pearson Education Inc, New Delhi.
2. Lindgren: Introduction to Probability & Statistics, MacMillan Publishers.
3. Rohatgi, V.K.: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi.
4. Randles, R.H. and Wolfe, D.A.: Introduction to the Theory of Non-parametric Statistics, John Wiley & Sons, New York.
5. Sidney Siegel: Non parametric Statistics, for behavioral sciences, International Student Edition, McGraw Hill Ltd, India.
6. Abraham Wald: Sequential Analysis, John Wiley & Sons, New York.

***** End *****

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. V Semester Course with effect from academic year 2015 -2016 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

FIFTH SEMESTER THEORY PAPER

STTH: 5.1: ANOVA, DESIGN OF EXPERIMENTS,

INDEX NUMBERS & SIMULATION

Unit I: Analysis of variance: Definition, Chance and Assignable causes of variation, object of analysis of variance, basic assumptions, Analysis of variance for one way, two way classified data with one observation per cell (fixed effect models only), Statement

of linear model, assumptions in the model, splitting the sum of squares in to various component parts, expected mean squares of various sums of squares, preparation of ANOVA tables, least significant difference, Two way classified data with interaction, case of multiple but equal number of observations per cell in two-way and three way classification, linear mathematical model, splitting sum of squares, expectation of various sums of squares, ANOVA table, interpretations.

(12Hours)

Unit II: Design of Experiments: Meaning, Important terms used in designs of experiments. Basic principles: Randomization, Replication and Local Control. Completely randomized design, Randomized block design and Latin Square designs – layout, models, least square estimates of parameters, hypothesis, test procedures and ANOVA tables. Merits and Demerits of the designs studied, Efficiency of design. Missing plot technique for RBD and LSD – Estimation of single missing observation.

(12 Hours)

Unit III: Factorial Experiments: Need for factorial experiments, 2^2 and 2^3 factorial experiments, Main effects and Interaction effects, their best estimates, idea of contrasts, orthogonal contrasts, Yates' method of computing factorial effect totals, Confounding, Partial and Total confounding, analysis of confounded designs in 2^2 , 2^3 designs with RBD layout.

(10 Hours)

Unit III: Index numbers: Definition, Problems involved in the construction of index numbers, methods of constructing index numbers of price and quantities, simple aggregate and price relatives method, weighted aggregate and weighted average of relatives method, important types of weighted index numbers: Laspeyre's , Paasche's, Bowley's, Marshall- Edgeworth, Fisher's, method of obtaining price and quantity index

numbers, tests of adequacy for index numbers, time reversal test, factor reversal test, for index numbers, Uses and limitations of index numbers. Consumer price index number: Problems involved in the construction of cost of living index number, uses, advantages and limitations, method of aggregative expenditure method and family budget method for the construction of consumer price index numbers.

(10Hours)

Unit V: Simulation: Introduction to simulation, Monte Carlo method generation of random numbers from discrete and continuous distributions, Simple illustrations to Monte Carlo method.

(06 Hours)

LIST OF PRACTICALS FOR FIFTH SEMESTER

STTH: 5.1: ANOVA, DESIGN OF EXPERIMENTS, INDEX NUMBERS & SIMULATION

1. Analysis of Variance – I
2. Analysis of Variance – II:
3. Analysis of Variance – III
4. Design of Experiments – I
5. Design of Experiments – II
6. Design of Experiments – III
7. Missing Plot Technique
8. Factorial Experiment – I.
9. Factorial Experiment – II
10. Index Numbers – I
11. Index Numbers – II

12. Simulation.

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for Study:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B.: An Outline of Statistical Theory, Volume I and II. The World Press Private Limited, Calcutta.
3. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.

Books for reference:

1. Montgomery, D.C.: Design and Analysis of Experiments, John Wiley & Sons, New York.
2. Das M.N. and Giri, N: Design of Experiments, Theory and Applications, Wiley Eastern Ltd. New Delhi.

***** End *****

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. V Semester Course with effect from academic year 2015 -2016 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

FIFTH SEMESTER THEORY PAPER

STTH: 5.2: SAMPLING THEORY AND DEMOGRAPHY

Unit I: Sampling and Survey methods: Concept of population and sample. Need for sampling, Complete Enumeration versus Sample Surveys, Merits and Demerits, Non – Probability and Probability Sampling, Need and illustrations. Use of random numbers, Principal steps in sample survey. Requisites of a good questionnaire. Pilot surveys, Sampling and non – sampling errors.

(10Hours)

Unit II: Simple random sampling: Description of SRS, simple random sampling according to with and without replacement procedures, Unbiased estimates of population mean and totals, Derivation of sampling variances, standard errors of estimators, Simple random sampling for proportions, derivation of variances of estimators and their estimation, determination of sample size for estimation of population mean and population proportion, Merits and demerits of Simple random sampling.

(10 Hours)

Unit III: Stratified random sampling: Need for stratification, stratifying factors, improvement of method over SRS, unbiased estimators of population mean and total in a stratified random sampling, derivation of standard errors, estimation of parameters, Allocation of sample size under Bowley's proportional method, Neyman's optimum allocations (for fixed sample size and for fixed cost), Variance of stratified sample mean in these cases, comparison of $Var(ran)$, $Var(prop)$ and $Var(opt)$ ignoring finite population correction, estimation of gain in precision due to stratification, over proportional, optimum and random methods, Merits and demerits of stratified random sampling.

(10 Hours)

Unit IV: Systematic random sampling: Systematic random sampling procedure of obtaining sample, unbiased estimators of population mean and its variance. Expression for variance of systematic sample mean with comparisons over within systematic sample, within stratum and with intra class correlation, Comparison systematic random sampling with stratified and simple random sampling under the assumption that the population has linear trend, Merits and demerits of systematic random sampling.

(10 Hours)

Unit V: Demography and Life Tables: Sources of demographic data, measurement of mortality, crude death rate, specific death rates, and standardized death rates, infant mortality rate, maternal mortality rate, neo natal mortality rates, merits and demerits and comparisons of various mortality rates. Fecundity, fertility, measurement of fertility, crude birth rate, general fertility rate, age specific fertility rate and total fertility rates, merits and demerits of each measure of fertility, comparative study of these measures of fertility, Growth rates: Gross reproduction rate and Net reproduction rates, their definition, distinctions, merits and demerits. Life tables: components of a life table, force of mortality and expectation of life, construction of life tables, relationship between various components of a life table, derivation of appropriate formulae for components, abridged life tables, Uses of life tables.

(10 Hours)

LIST OF PRACTICALS FOR FIFTH SEMESTER

STTH: 5.2: SAMPLING THEORY AND DEMORAPHY

1. Drawing random samples from a population (With and Without replacement using random number tables)
2. Simple Random Sampling
3. Stratified Random Sampling

4. Systematic Random Sampling
5. Mortality rates
6. Fertility rates
7. Growth rates
8. Life tables.

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for study:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.
3. Dr. Gupta, B.N.: Statistics (Theory & Practice), Sahitya Bhavan, Agra.
4. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.

Books for reference:

1. William G. Cochran: Sampling Techniques, Wiley Eastern Ltd., New Delhi.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B.: Fundamentals of Statistics Volume I and II. The World Press Private Limited, Calcutta.
3. Sampath, S.: Sampling Theory and Methods, Narosa Publishing House, New Delhi.
4. Murthy, M.N.: Sampling Theory and Methods, Statistical Society, ISI, Calcutta.
5. Des Raj and Chandok: Sampling Theory of Surveys with Applications, Indian Society of Agricultural Sciences, New Delhi.

***** End *****

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. VI Semester Course with effect from academic year 2015 -2016 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

SIXTH SEMESTER THEORY PAPER

STTH: 6.1: OPERATIONS RESEARCH

Unit I: Operations research: Introduction, Meaning, and definition of operation research, phases of O.R., O.R. Models, Scope of O.R., Linear Programming Problem: Definition of general linear programming problem, Basic concepts, and formulation of LPP, Graphical solution, Simplex method of solving an LPP, Slack, Surplus and Artificial variables, Charne's M- technique of solving LPP, Two phase simplex method, Concept of Duality of an LPP, Conversion of Standard Primal and Dual problems and vice versa..

(12 Hours)

Unit II: Transportation Problem & Assignment Problem: Definition, mathematical model, balanced and unbalanced TP, Methods of obtaining Initial basic feasible solution: North West corner rule, Lowest Cost Entry Method, Vogel's Approximation Method (VAM), Test for optimality by MODI method, Determination of optimal solution. Assignment problem: definition, mathematical model, balanced and unbalanced assignment problem, maximization and minimization problems under assignment, Hungarian method of solving an AP, Distinction between Transportation Problem & Assignment Problem.

(12Hours)

Unit III: Sequencing problems: Principle assumptions, Johnson's procedure for determining an optimal sequence, Problems of two machines and 'n' jobs, Three machines and 'n' jobs reducible to two machines and 'n' jobs, calculation of total elapsed time and idle time, Traveling Salesman problem and its solution.

(10 Hours)

Unit IV: Game theory: Introduction, two person zero sum games, Pure and mixed strategies, maximin and minimax principle, games with saddle point and without saddle points, solution of 2x2 rectangular games, 2xn and mx2 graphical method of solving game problems, dominance rule, matrix oddments method for 3x3 games.

(8Hours)

Unit V:Inventory Theory: Description of an inventory system, Inventory system, inventory cost, demand and lead time, EOQ model with and without shortages, EOQ model with finite replenishment, Probabilistic demand, News paper boy problem.

(8 Hours)

LIST OF PRACTICALS FOR FIFTH SEMESTER

STTH: 6.1: OPERATIONS RESERACH

1. Formulation of Linear Programming Problem:
2. Graphical method of Solving Linear Programming Problems.
3. Simple Method – I
4. Simplex Method – II
5. Transportation Problem
6. Assignment Problem
7. Sequencing Problems.
8. Game Theory – I
9. Game theory – II
10. Inventory Theory.

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for study:

1. Kanti Swarup, Gupta, P.K. and Man Mohan: Operations Research, Sultan Chand & Sons, New Delhi.
2. Gupta, P.K. and Hira, D.S.: Operations Research, S. Chand & Company Ltd., New Delhi.
3. Gupta, R.K.: Operations Research, Krishna Prakashana Mandir, Meerut.
4. Sharma, S.D.: Operations Research, Kedarnath Ramnath & Co. Publishers, Meerut.
5. Kapoor, V.K: Operations Research, Sultan Chand & Sons, New Delhi.
6. Kapoor, V.K.: Operations Research Problems & Solutions, Sultan Chand & Sons, New Delhi.
7. Dr. Goel, B.S. and Dr. Mittal, S.K.: Operations Research, Pragati Prakashan, Meerut.

Books for reference:

1. Hamdy A. Taha: Operations Research An Introduction (Seventh Edition), Prentice – Hall of India Pvt. Ltd, New Delhi.
2. Frederick S. Hillier & Gerald J. Liberman: Introduction to Operations Research (Eighth Edition), Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. Mustafi, C.K.: Operations Research Methods and Practice, New Age Pub. New Delhi.
4. Churchman, C.W., Ackoff, R.L., and Arnoff, E.L.: Introduction to Operations Research, John Wiley Pub. New York.

***** End *****

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

Revised syllabi of Optional Statistics for B.A. / B.Sc. VI Semester Course with effect from academic year 2015 -2016 onwards.

STATISTICS (OPTIONAL)

B.A. / B.Sc. COURSE IN STATISTICS

SIXTH SEMESTER THEORY PAPER

STTH: 6.2: STATISTICAL QUALITY MANAGEMENT, TIME SERIES, ECONOMETRICS AND RELIABILITY

Unit I: Statistical Quality Control: Basics – Quality assurance and management, quality pioneers, quality costs, Meaning, aims and objectives of statistical quality control. Chance & Assignable causes of variation, Statistical quality control, Process control, Product control. Importance & uses of statistical quality control in industry.

(04 Hours)

Unit II: Control chart: Control charts for variables: Theoretical basis and practical background of control charts for variables. 3σ - Limits, Warning limits and Probability limits. Derivation of control limits and construction of \bar{X} & R charts and interpretation Criteria for detecting lack of control. Rational subgroups, group control charts and sloping control charts, Natural tolerance limits and specification limits. Process capability studies.

Control charts for attributes: Fraction defective p-chart, No. of defectives np-chart, No. of defects per unit C – chart, and U – chart, Basis of construction, derivation of control limits and interpretation, interpretations.

(12Hours)

Unit III: Time Series: Economic time series, its different components, illustrations, Additive and Multiplicative models, analysis of time series, determination of secular trend, method of moving averages, least squares method – linear, quadratic, exponential trend fittings to the data. Seasonal variation, definition, illustrations, measurements, simple average method, ratio to moving average method, ratio of trend method, link relatives method, Cyclical variation, definition, distinction from seasonal variation, Irregular variation, definition, illustrations.

(10 Hours)

Unit IV: Econometrics: Definition and scope of econometrics, Relationship between econometrics, mathematical economics and statistics, goals of econometrics, limitations, Simple linear regression model, role disturbance term in the model, ordinary least square method (OLS), Statistical assumptions, desirable small sample properties of least square estimators, Large sample properties of estimators, Linearity, unbiasedness, minimum variance property, Sampling distribution of least square estimators, Idea of auto correlation, heteroscedasticity, multicollinearity etc., with suitable illustrations.

(12 Hours)

Unit – V: Reliability: Definitions of Reliability Theory, reliability function, failure rate (hazard rate), cumulative failure rate. Distributions useful in modeling the life length (Exponential, Weibull, Gamma, Pareto, Truncated Normal and Log Normal). Monotone failure rates, Classes of life Distributions (IFR, IFRA, NBU, NBUE, DMRL) and their geometric characterization. System Reliability: Series System, Parallel System and Standby Redundant System in case of exponential distributions.

(12 hours)

LIST OF PRACTICALS FOR SIXTH SEMESTER

STTH: 6.1: OPERATIONS RESERACH

1. Control Charts – I.
2. Control Charts – II
3. Time Series – I
4. Time Series – II
5. Exercise on Econometrics: Method of ordinary least squares.
6. Reliability – I
7. Reliability – II

Demonstration of practicals using MS Excel, R-Programming, & SPSS.

Books for Study:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
3. Goon, A.M., Gupta, M.K. and Dasgupta, B.: An Outline of Statistical Theory, Volume I and II. The World Press Private Limited, Calcutta.
4. S. Shyamala, Navdeep Kaur, T Arul Pragasam: A text book on Econometrics, Theory and Applications, Vishal Publishing Company, New Delhi.

Books for reference:

1. Montgomery Douglas C.: Introduction to Statistical Quality Control, John Wiley & Sons, Inc. (Wiley Student Edition).
2. Grant, E.L. and Richard S. Leavenworth: Statistical Quality Control, McGraw-Hill Book Company Inc., New York.
3. Gupta, R.C.: Statistical Quality Control, Khanna Publishers, New Delhi.
4. Jerry Banks: Quality Control, John Wiley Pub. New York.
5. Mahajan, M: Statistical Quality Control, Dhanpat Rai & Co. Ltd. New Delhi

***** End *****

KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF STATISTICS

APPLIED STATISTICS (OPTIONAL)

B.A. SEMESTER DEGREE COURSE IN STATISTICS

The revised syllabus at B.A. degree course in respect of semester scheme spread over six semesters is implemented as under:

(1) Revised syllabi of Applied Statistics for B.A. I & II Semester Course with effect from academic year 2013 -2014.

(2) Revised syllabi of Applied Statistics for B.A. III & IV Semester Course with effect from academic year 2014 -2015 onwards.

(3) Revised syllabi of Applied Statistics for B.A. V & VI Semester Course with effect from academic year 2015 -2016 onwards.

KARNATAKUNIVERSITY, DHARWAD

APPLIED STATISTICS (OPTIONAL)

B.A. DEGREE SEMESTER COURSE IN STATISTICS

ELIGIBILITY:

(1) The students who have any of three optional subjects such as Mathematics, Statistics, and Elements of Mathematics & Statistics at B.A. course are not eligible to offer the Applied Statistics course.

General Instructions: (First to Fourth Semester)

1. The theory paper carries 80 marks and is of 3 hours duration.
2. There will be an Internal Assignment marks for theory as per KarnatakUniversity rules and regulations. Theory paper carries 20 internal assessment marks. The total marks for theory paper is 100 including the internal assignment marks.
3. There will be 5 hours of lecturing per week for theory paper which includes one hour problem solving per week as a practical.
4. Use of simple calculators and scientific calculators is permitted in theory classes and during theory examination.

General Instructions :(Fifth & Sixth Semester)

1. There will be two theory papers.
2. The each theory paper carries 80 marks and is of 3 hours duration.
3. There will be an Internal Assignment marks for theory as per KarnatakUniversity rules and regulations. Each theory paper carries 20 marks. The total marks for each theory paper is 100 including the internal assignment marks.
4. There will be 5 hours of lecturing per week for theory paper.
5. Use of simple calculators and scientific calculators is permitted in theory classes and during theory examination.

B.A. FIRST SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTH: 1: DESCRIPTIVE STATISTICS

Unit I: Introduction: Introduction to statistics, origin, meaning, definition, functions, scope and limitations of statistics. Statistical investigation, Sources of data, Methods of data collection, nature and type of enquiry, definition of the unit of data collection,

primary and secondary data, methods of collecting primary data; direct, indirect, schedules sent through enumerators, mailed questionnaire method with merits and demerits, sources of secondary data, questionnaire and schedule and their distinctions, requisites of a good questionnaire.

(10 Hours)

Unit II: Classification & Tabulation: Classification of a statistical data, meaning, object, basis of classification: geographical, chronological, qualitative and quantitative. Tabulation of data: meaning, purpose of construction of tables, structure of a table, parts of a good statistical table, rules for forming a table, parts of a good statistical table, Construction of blank tables of one way, two way, three way and four way tables, general purpose and specific purpose tables, Advantages, limitations of tabulation, distinction between classification & tabulation. Formation of a frequency distribution (with inclusive and exclusive classes), Construction of cumulative frequency distributions.

(10 Hours)

Unit III: Diagrammatic and Graphical Presentation: Diagrammatic presentation of data: One dimensional diagrams; simple, component, multiple, percentage, deviation bar diagrams, two dimensional diagrams: rectangles, pie diagram. Rules for drawing diagrams, Graphical presentation of a frequency distribution: Histogram, frequency polygon, frequency curve, O-give curves of less than type and more than type, simple computations w.r.t. graphs studied.

(10 Hours)

Unit IV: Measures of central tendency: Meaning of central tendency and measure of central tendency, Ideal characteristics for a measure of central tendency, Definition, formulae of arithmetic mean, geometric mean, harmonic mean, median and mode for

ungrouped data, and grouped data, Partition values, quartiles, deciles and percentiles formulae, merits and demerits of various measure of central university.

(10 Hours)

Unit V: Measure of dispersion: Meaning of dispersion, need for dispersion, absolute and relative measures, range, quartile deviation, mean deviation, standard deviation and variance, definition, merits & demerits, coefficient of variation, properties of measures of dispersion, examples.

(10 Hours)

Unit VI: Measures of Skewness and Kurtosis: Meaning of skewness, definition of skewness, detection of skewness, types of skewness, absolute and relative measures, Prof. Karl Pearson's coefficient of skewness, Prof. Bowley's coefficient of skewness, Meaning of kurtosis, types of kurtosis, Examples for skewness calculation.

(10 Hours)

BOOKS FOR STUDY:

14. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
15. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.
16. Shenoy, G.V., Srivastava, U.K. and Sharma S.C.: Business Statistics, Wiley Eastern Ltd., New Delhi.
17. Gupta, C.B.: An Introduction to Statistical Methods, Vani Educational Books, a division of Vikas Publishing House, New Delhi.
18. Dr. Gupta, B.N.: Statistics (Theory & Practice), Sahitya Bhavan, Agra.
19. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.

20. Aggarwal, Y.P.: Statistical Methods: Concepts, Applications and Computations, Sterling Publishers Pvt. Ltd., New Delhi.
21. Sharma, J.K.: Business Statistics, Pearson Education Private Ltd. New Delhi.
22. Gupta S.C. and Mrs. Indra Gupta: Business Statistics, Himalaya Publishing House, Bombay.
23. Sancheti & Kapoor: Statistics Theory, Methods & Applications, Sultan Chand & Sons, New Delhi.
24. Gani, S.G.: Introductory Statistics & Computer, Uday Ravi Books, Bijapur.
25. Siddanagoudar, B.N.: Vyavaharika Sankhyasahastra, Sujata Prakashana, Chikkamagalur.

BOOKS FOR REFERENCE:

1. Richard I. Levin: Statistics for Management, Prentice – Hall of India Pvt. Ltd, New Delhi.
2. Robert V. Hogg and Allen T. Craig: Introduction to Mathematical Statistics (Fifth Edition), Pearson Education Inc, New Delhi.

* * * * * End * * * * *

B.A. SECOND SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTH: 2: ECONOMIC STATISTICS, CORRELATION & REGRESSION

Unit I: Index numbers: Definition of an Index number, Idea of fixed and chain base index numbers, methods of constructing index numbers of price and quantities, problems involved in the construction of index numbers, simple aggregate and price relatives method, weighted aggregate and weighted average of relatives method, important types of weighted index numbers: Laspeyre's , Paasche's, Bowley's, Marshall-Edgeworth, Fisher's, method of obtaining price and quantity index numbers, tests for

index numbers, time reversal test, factor reversal test, for index numbers, Uses, and limitations of index numbers, Consumer price index number: Problems involved in the construction of cost of living index number, uses, and limitations, method of aggregative expenditure method and family budget method for the construction of consumer price index numbers.

(15 Hours)

Unit II: Time Series: Definition of time series, examples for time series, Economic time series and its different components, illustrations, determination of secular trend, graphic method, method of moving averages, least squares method – linear, quadratic fittings to the data. Seasonal variation, definition, illustrations, measurements, simple average method, Cyclical variation, definition, distinction from seasonal variation, Irregular variation, definition, illustrations.

(15 Hours)

Unit III: Correlation for variables and attributes: Meaning, types of correlation: positive, negative and zero correlation, spurious correlation, linear and non linear correlation, method of measuring correlation: scatter diagram, Prof. Karl Pearson's coefficient of linear correlation, and properties (without proof), And examples, Correlation for attributes: Spearman's rank correlation coefficient between attributes with ties and without ties.

(10 Hours)

Unit IV: Regression: Meaning of regression, difference between correlation and regression, regression equation of X on Y and Y on X, regression coefficient, definition, properties of regression coefficient (without proof), properties of regression lines, examples illustrating them, angle between two regression lines, their graphic sketches.

(10 Hours)

Unit V: Association of Attributes: Classification of data, notations used, combinations of attributes with 2 and 3 only, order of classes and class frequencies, ultimate class, Frequencies of positive classes and negative classes, Relation between class frequencies, consistency of data, independence of attributes, criterion of independence, Positive association and Negative association between two attributes, Yule's coefficient of association.

(10 Hours)

BOOKS FOR STUDY:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.
3. Dr. Gupta, B.N.: Statistics (Theory & Practice), Sahitya Bhavan, Agra.
4. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
5. Sharma, J.K.: Business Statistics, Pearson Education Private Ltd. New Delhi.
6. Sancheti & Kapoor: Statistics Theory, Methods & Applications, Sultan Chand & Sons, New Delhi.
7. Gani, S.G.: Introductory Statistics & Computer, Uday Ravi Books, Bijapur.
8. Siddanagoudar, B.N.: Vyavaharika Sankhyasahastra, Sujata Prakashana, Chikkamagalur.

BOOKS FOR REFERENCE:

1. Ray & Sharma: Mathematical Statistics, Ram Prasad & Sons, Agra.
2. Richard I. Levin: Statistics for Management, Prentice – Hall of India Pvt. Ltd, New Delhi.

* * * * * End * * * * *

B.A. THIRD SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTH: 3: PROBABILITY, EXPECTATION, PROBABILITY DISTRIBUTIONS

Unit I: Probability: Definition of some important terms: random experiment, sample space, event, equally likely events, exhaustive events, equally likely events, complimentary events, Definition of probability of an event, classical approach, simple examples on probabilities,. Theorems associated with probability of events, Addition theorem on probability for two events (without proof), examples, definition of independent and dependent events, multiplication and conditional probability theorem for two events (without proof), with and without replacement selection procedure, examples based on these theorems, examples on probabilities utilizing both addition and conditional probability theorems.

(15 Hours)

Unit II: Random variable and Mathematical Expectation: Definition of a random variable, discrete and continuous random variable, idea of probability mass function and distribution, definition of mathematical expectation of a random variable, theorems on mathematical expectation- addition and multiplication theorem without proof, $E(aX + b)$, $Var(aX + b)$ computations for the discrete probability functions, simple examples.

(15 Hours)

Unit III: Binomial distribution: Definition of a Binomial variate and its probability distribution, Examples for binomial distribution, situations under which binomial

distribution arises, statement of mean, mode, variance, skewness and kurtosis, limiting distribution, simple examples on binomial distribution, fitting of a binomial distribution.

(10 Hours)

Unit IV: Poisson distribution: Definition of a Poisson variate and its probability distribution, Examples for Poisson distribution, situations under which Poisson distribution arises, statement of mean, mode, variance, skewness and kurtosis, limiting distribution, simple examples on Poisson distribution, fitting of a Poisson distribution.

(10 Hours)

Unit V: Normal distribution: Definition of a normal variate and its probability density function, Definition of a standard normal variate, Conditions for existence of a normal distribution as a limiting case of binomial distribution & Poisson distribution, statement of mean, median, mode, quartile deviation, mean deviation, variance, skewness and kurtosis, and other properties of a normal distribution, , simple examples on normal distribution, idea of a standard normal variate tables, computation of probabilities using standard normal variate tables, simple examples, importance of a normal distribution.

(10 Hours)

BOOKS FOR STUDY:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.
3. Dr. Gupta, B.N.: Statistics (Theory & Practice), Sahitya Bhavan, Agra.
4. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
5. Sancheti & Kapoor: Statistics Theory, Methods & Applications, Sultan Chand & Sons, New Delhi.

6. Gani, S.G.: Introductory Statistics & Computer, Uday Ravi Books, Bijapur.
7. Siddanagoudar, B.N.: Vyavaharika Sankhyasahastra, Sujata Prakashana, Chikkamagalur.

BOOKS FOR REFERENCE:

1. Robert V. Hogg and Allen T. Craig: Introduction to Mathematical Statistics (Fifth Edition), Pearson Education Inc, New Delhi.

* * * * * End * * * * *

B.A. FOURTH SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTH: 4: SAMPLING DISTRIBUTION AND TEST OF SIGNIFICANCE

Unit I: Sampling distribution: Definition of some important terms: Population, Sample, Sampling, sample size (large & small), parameter, statistic,

Concept of sampling distribution, definition of standard error, uses of standard error, standard error of mean, difference of two sample means, proportion, difference of two proportions in case of large sample from a normal population.

(05 Hours)

Unit II: Point Estimation & Interval estimation: Estimator, parameter, point estimation, properties of estimators, unbiasedness, consistency, efficiency and sufficiency of estimators and definitions, simple examples, interval estimation, $100(1 - \alpha)\%$ confidence interval for mean, difference of two population means in case of large and small samples, for proportions and difference of proportions in case of large samples, confidence interval for population variance, expressions, simple examples.

(15 Hours)

Unit III: Test of Significance: Some important definitions of hypothesis, simple and composite, null and alternative hypothesis, critical region, type I and type II error and their sizes, level of significance, random sample with suitable examples, Large sample test for population mean, difference of population means, proportion and difference of two population proportions. Examples based on it.

(10 Hours)

Unit IV: Chi-square distribution: Definition of a chi-square variate with one and 'n' degrees of freedom, Statement of mean, mode, variance, skewness and kurtosis and other important characteristics, degrees of freedom, applications of chi-square test statistic for testing (i) population variance (ii) goodness-of-fit of distributions (iii) independence of attributes in a contingency tables of 2×2 , $r \times s$. Conditions imposed for application of a chi-square test. Yates' correction for continuity. Examples for the applications of chi-square test.

(12 Hours)

Unit V: Students t-distribution: Definition of student's t-statistic, definition of Fisher's t-variate, Statement of mean, variance, skewness, kurtosis of fisher's t-variate, Applications of students t-statistics for (i) testing single population mean (ii) test for difference of two sample means in case independent samples drawn from a normal distribution, (iii) Behren's d-test for paired but dependent samples.

(12 Hours)

Unit VI: Snedecor's F-distribution: Definition of an F-statistic and F-variate, Statement of Mean, variance of F-distribution, Application of F-distribution for testing equality population variances, Simple examples.

(06 Hours)

BOOKS FOR STUDY:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.
3. Gupta, C.B.: An Introduction to Statistical Methods, Vani Educational Books, a division of Vikas Publishing House, New Delhi.
4. Dr. Gupta, B.N.: Statistics (Theory & Practice), Sahitya Bhavan, Agra.
5. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
6. Sancheti & Kapoor: Statistics Theory, Methods & Applications, Sultan Chand & Sons, New Delhi.
7. Gani, S.G.: Introductory Statistics & Computer, Uday Ravi Books, Bijapur.
8. Siddanagoudar, B.N.: Vyavaharika Sankhyasahastra, Sujata Prakashana, Chikkamagalur.

BOOKS FOR REFERENCE:

1. Mendenhall William, Robert J. Beaver, Barbara M. Beaver: Probability and Statistics, India Edition, Cengage Learning Private India Limited, New Delhi.

* * * * * End * * * * *

B.A. FIFTH SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTT: 5.1: SAMPLING THEORY AND INDUSTRIAL STATISTICS

Unit I: Sampling theory: Meaning of census and sample surveys, their relative merits and demerits, planning and execution of sample surveys, Types of errors in sample surveys, non response errors, errors in response, errors in processing of data, etc., Questionnaire and Schedules, their distinctions, Requisites of a good questionnaire, drafting of a questionnaire, probability and non-probability sampling methods.

(10Hours)

Unit II: Simple random sampling: Description of SRS, simple random sampling according to with and without replacement procedures, Unbiased estimates of population mean and totals, Formulae of sampling variances, standard errors of estimators, Formula for determination of sample size for estimation of population mean, Merits and demerits of Simple random sampling.

(10 Hours)

Unit III: Stratified random sampling: Need for stratification, stratifying factors, improvement of method over SRS, unbiased estimators of population mean and total in a stratified random sampling, formula for variance of sample mean and of standard errors, Bowley's proportional method, Neyman's optimum allocations, Allocation of sample size under proportional method and under Neyman optimum method for fixed sample size, Merits and demerits of stratified random sampling.

(10 Hours)

Unit IV: Systematic random sampling: Systematic random sampling procedure, idea of a random start and sampling interval, examples for drawing a systematic random sample, unbiased estimators of population mean and its variance. Merits and demerits of systematic random sampling, Situations where systematic random sampling is used.

(10 Hours)

Unit V: Industrial statistics: Meaning and applications of statistical quality control, Uses of SQC in industry, chance and assignable causes, quality, process control and product control, Theoretical basis for construction of control chart for variables and attributes, Chart for variable, Construction of \bar{X} and R charts, rational sub group, criteria of detecting lack of control, interpretation of charts.

(10 Hours)

Unit VI: Control chart for attributes: Basis of construction, fraction defective p-chart, no. of defectives np-chart, no. of defects per unit C-chart, Statement of control limits, detection of lack of control, interpretations.

(10Hours)

BOOKS FOR STUDY:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.
3. Shenoy, G.V., Srivastava, U.K. and Sharma S.C.: Business Statistics, Wiley Eastern Ltd., New Delhi.
4. Gupta, C.B.: An Introduction to Statistical Methods, Vani Educational Books, a division of Vikas Publishing House, New Delhi.
5. Dr. Gupta, B.N.: Statistics (Theory & Practice), Sahitya Bhavan, Agra.
6. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
7. Sancheti & Kapoor: Statistics Theory, Methods & Applications, Sultan Chand & Sons, New Delhi.
8. Gani, S.G.: Applied Statistics (Section I and II), Uday Ravi Books, Bijapur

BOOKS FOR REFERENCE:

1. Montgomery Douglas C.: Introduction to Statistical Quality Control, John Wiley & Sons, Inc. (Wiley Student Edition).
2. Grant, E.L. and Richard S. Leavenworth: Statistical Quality Control, McGraw-Hill Book Company Inc., New York.
3. Gupta, R.C.: Statistical Quality Control, Khanna Publishers, New Delhi.
4. Mahajan, M: Statistical Quality Control, Dhanpat Rai & Co., New Delhi.

5. Sampath, S.: Sampling Theory and Methods, Narosa Publishing House, New Delhi.
6. Murthy, M.N.: Sampling theory and methods, Statistical Society, ISI, Calcutta.
7. William G. Cochran: Sampling Techniques, Wiley Eastern Ltd., New Delhi.

* * * * * End * * * * *

B.A. FIFTH SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTH: 5.2: DEMOGRAPHY AND LIFE TABLE

Unit I: Demography: Sources of demographic data, measurement of mortality, crude death rate, specific death rates, and standardized death rates, infant mortality rate, maternal mortality rate, neo natal mortality rates, merits and demerits and comparisons of various mortality rates, numerical problems on these measures.

(10 Hours)

Unit II: Measurement of fertility: Fecundity, fertility, measurement of fertility, crude birth rate, general fertility rate, age specific fertility rate and total fertility rates, merits and demerits of each measure of fertility, comparative study of these measures of fertility, Growth rates, reproduction rates, gross reproduction rate and net reproduction rates, their definition, distinctions, merits and demerits, numerical problems on these measures.

(10 Hours)

Unit III: Life tables: Components of a life table, force of mortality and expectation of life, construction of life tables, relationship between various components of a life table, Appropriate formulae for components, Abridged life tables, Uses of life tables, Numerical problems for construction life tables with missing entries.

(10 Hours)

Unit IV: National Population Census: Definition of population census, Essential features of the Census, Utility of census, methods of conducting population census; De-facto method and De-jure method, comparative study of these two methods, merits and demerits, Methods of enumeration; Household method, Canvasser method, Mailed questionnaire method.

(10 Hours)

Unit V: Indian Official Statistics: Indian statistical system at present, Statistical organizations in India, Statistical organizations at the centre, Central statistical organization (CSO), functions of CSO, Publications of CSO, National Sample Survey Organization (NSSO), functions of NSSO, Statistical organizations in the state.

(10 Hours)

Unit VI: Government and Non-government statistical organizations: Different central ministries and the major statistical organizations held by them, Directorate of Economics and Statistics, functions of DES, publications of the DES, The various Non-governmental statistical organization, the functions of Indian Statistical Institute, Calcutta, The Indian council of agricultural research (ICAR), Department of Statistics, Reserve Bank of India. Indian statistical material: agricultural statistics, population statistics, price statistics, industrial, trade, financial and labour statistics.

(10 Hours)

BOOKS FOR STUDY:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Shenoy, G.V., Srivastava, U.K. and Sharma S.C.: Business Statistics, Wiley Eastern Ltd., New Delhi.

3. Gupta, C.B.: An Introduction to Statistical Methods, Vani Educational Books, a division of Vikas Publishing House, New Delhi.
4. Dr. Gupta, B.N.: Statistics (Theory & Practice), Sahitya Bhavan, Agra.
5. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
6. Gani, S.G.: Applied Statistics (Section I and II), Uday Ravi Books, Bijapur

BOOKS FOR REFERENCE:

1. Agarwal B.L.: Basic Statistics, Wiley Eastern Ltd., New Delhi.

* * * * * End * * * * *

B.A. SIXTH SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTH: 6.1: OPERATIONS RESEARCH

Unit I: Operations research: Meaning, and definition of operation research, phases of O.R., O.R. Models, Scope of O.R., Definition of general linear programming problem, examples of L.P.P., formulation of LPP with two variables, Graphical method of solving an LPP, cases of unique solution, unbounded solution, multiple solution, no solution etc., to be taken up.

(15Hours)

.Unit II: Simplex Method: Idea of simplex method of solving LPP, definition of Slack, Surplus and Artificial variables, Converting general LPP in to standard form of LPP, Reading of entering and departing variable with simplex tableau, Writing of primal and dual of standard problems.

(09 Hours)

Unit III: Transportation Problem: Definition, mathematical model, balanced and unbalanced TP, Initial basic feasible solution by North West corner rule, lowest cost

entry method, Vogel's approximation method, Testing of initial basic feasible solution for optimality.

(08 Hours)

Unit IV: Assignment Problem: Definition, mathematical model, balanced and unbalanced assignment problem, maximization and minimization problems under assignment, Hungarian method of solving an AP, Distinction between transportation problem and an Assignment problem.

(08 Hours)

Unit V: Sequencing Problems: Principle assumptions, Johnson's procedure for determining an optimal sequence, Problems of two machines and 'n' jobs, calculation of total elapsed time and idle time.

(10 Hours)

Unit VI: Game theory: Introduction, two person zero sum games, maximin and minimax principle, games with saddle point and without saddle points, pure and mixed strategies, solution of 2x2 rectangular games, Solving mxn game problems, using dominance rule.

(10 Hours)

BOOKS FOR STUDY:

1. Kanti Swarup, Gupta, P.K. and Man Mohan: Operations Research, Sultan Chand & Sons, New Delhi.
2. Gupta, P.K. and Hira, D.S.: Operations Research, S. Chand & Company Ltd., New Delhi.
3. Gupta, R.K.: Operations Research, Krishna Prakashana Mandir, Meerut.

4. Sharma, S.D.: Operations Research, Kedarnath Ramnath & Co. Publishers, Meerut.
5. Kapoor, V.K: Operations Research, Sultan Chand & Sons, New Delhi.
6. Dr. Goel, B.S. &Dr. Mittal, S.K.: Operations Research, Pragati Prakashana, Meerut.
7. Gani, S.G.: Applied Statistics (Section I and II), Uday Ravi Books, Bijapur.

BOOKS FOR REFERENCE:

1. Hamdy A. Taha: Operations Research An Introduction (Seventh Edition), Prentice – Hall of India Pvt. Ltd, New Delhi.
2. Frederick S. Hillier &Gerals J. Liberman: Introduction to Operations Research (Eighth Edition), Tata McGraw-Hill Publishing Company Limited, New Delhi.

* * * * * End * * * * *

B.A. SIXTH SEMESTER – APPLIED STATISTICS (OPTIONAL)

STTH: 6.2: ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS

Unit I: Analysis of Variance: Definition, object, basis assumptions, analysis of variance for one way classified data, assumptions in the linear mathematical model, splitting up of the total sum of squares into various components, preparation of analysis of variance table, numerical problems.

(10 Hours)

Unit II: Analysis of variance for a two-way classified data: Assumption and statement of linear mathematical model, splitting up of the total sum of squares into various components, preparation of analysis of variance table, numerical problems.

(10 Hours)

Unit III: Design of Experiments: Definition, scope of design of experiments, meaning of uniformity trials, experimental unit, experimental material, treatment, experimental

error, replication, block, precession, efficiency, principles of experimentation: randomization, replication and local control use of these in the design of experiments.

(10 Hours)

Unit IV: Completely Randomized Design: Definition, layout, linear mathematical model, ANOVA table, merits and demerits of design, numerical problems.

(10 Hours)

Unit V: Randomized Block Design: Definition, layout, linear mathematical model, ANOVA table, Estimation of a single missing value only, relative efficiency of RBD over CRD, merits and demerits of design, numerical problems.

(10 Hours)

Unit VI: Latin Square design: Definition, layout, linear mathematical model, ANOVA table, Estimation of single missing value only, merits and demerits of design, numerical problems.

(10 Hours)

BOOKS FOR STUDY:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta, S.C.: Fundamentals of Statistics, Himalaya Publishing House, Bombay.
3. Gani, S.G.: Applied Statistics (Section I and II), Uday Ravi Books, Bijapur.

BOOKS FOR REFERENCE:

1. Kempthorne Oscar: Design and Analysis of Experiments, Wiley Eastern Ltd., New Delhi.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B.: An Outline of Statistical Theory, Volume II. The World Press Private Limited, Calcutta.

* * * * * End * * * * *

B.COM. THIRD AND FOURTH SEMESTER BUSINESS STATISTICS SYLLABUS

Paper – 3.6 BUSINESS STATISTICS – I

(This subject is to be offered by Students who have not studied Statistics at PUC level)

Objectives: To equip students with the understanding and applications of statistical methods in business data processing and interpretation.

Unit – 1: *Introduction and Statistical Investigation:* Origin and development, definition, importance and scope of business statistics; meaning and definition of data – methods of data collection; questionnaire, schedule and interview methods.

Unit – 2: *Classification and Tabulation of Data:* Classification – definition, objectives and types of classification; formation of discrete and continuous frequency distribution.

Tabulation: Definition and objectives; difference between classification and tabulation; parts of table; types of tables – simple and complex tables, general and special purpose tables.

Unit – 3: *Diagrammatic and Graphical Representation:* Introduction, significance of diagrams and graphs, difference between diagrams and graphs. Diagram: Types of diagram – One Dimensional or Bar diagrams. Two Dimensional or area diagrams, pictograms and cartograms; Graphs: Graphs of Frequency distribution – Histogram,

Frequency Polygon, Frequency Curve, Ogives or Cumulative Frequency Curves and Line Graphs.

Unit – 4: Measures of Central Tendency or Averages: Definition and objectives, averages; requisites of ideal averages: Types of averages – Mean, Median, Mode, Harmonic Mean, Geometric Mean – Definition, Computation, Merits and Demerits; Applications in Business.

Unit – 5: Measures of Dispersion and Skewness: Measures of Dispersion: Introduction, Definition, Properties of Ideal Measure of Dispersion, Absolute and Relative.

Measures of Dispersion – Range and Coefficient of Range, Quartile and Coefficient of Q.D., Average Deviation (AD) and Coefficient of S.D. and Coefficient of Variation, Merits and Demerits – Applications in Business.

Measures of Skewness: Definition, Difference between Dispersion and Skewness, Absolute and Relative Measures of Skewness – Karl Pearson, Bowley's and Kelly's Coefficient of Skewness, Applications in Business.

Suggested Readings:

1. Levine, Business Statistics – A First Course, Pearson Education, New Delhi.
2. M.L. Berenson and David M. Levine: Basic Business Statistics, PHI, New Delhi.
3. S.C. Gupta: Fundamentals of Statistics, HPH, New Delhi.
4. S.P. Gupta: Statistical Methods, Sultan Chand & Sons, New Delhi.
5. J.K. Sharma: Business Statistics, Pearson Education, New Delhi.
6. Naval Bajapai: Business Statistics, Pearson Education, New Delhi.
7. Shukla & Sahai: Business Statistics, Sahitya Bhavan, Agra.
8. Shenoy and Srivastava: Business Statistics, New Age International, New Delhi.
9. Goel & Goel: Mathematics & Statistics, Taxmann, New Delhi.
10. G.C. Beri: Business Statistics, TMH, New Delhi.

***** End *****

Paper – 4.6 BUSINESS STATISTICS – II

(This subject is to be offered by Students who have not studied Statistics at PUC level)

Unit – 1:Correlation and Regression: Correlation – definition, type and methods of correlation; Graphical method, Scatter diagram method; Karl Pearson’s Coefficient of Correlation; Spearman’s Rank Correlation Coefficient; Properties of correlation coefficient; Regression: definition and uses; difference between correlation and regression, regression equations – X on Y and Y on X; construction of regression equations.

Unit – 2:Time Series: Definition and components of time series; methods of measuring secular trend – graphical methods; methods of semi – averages; method of moving averages; method of least squares.

Unit – 3:Index Numbers: Definition, types, uses and steps involved in construction of Index numbers; Laspeyre’s, Paasche’s, Fisher’s, Dorbish and Bowley’s and Marshall Edgeworth Index Numbers; tests of adequacy of index numbers – time reversal test and factor reversal test; Consumer Price Index Number – definition, uses and methods of construction of Consumer Price Index Number.

Unit – 4:Theory of Sampling: Meaning, Scope of Sampling; theoretical basis and types of sampling – simple random and stratified random sampling, systematic sampling, multistage sampling, merits and demerits of each; uses and errors of sampling, Census and Sample Surveys.

Unit – 5:Probability: Definition of random experiment, event , sample space, types of events; mutually exclusive events, mutually exhaustive events, equally likely events;

definition of probability; statement of addition and multiplication theorems; theorem of conditional probability; problems on probability.

Suggested Readings:

1. Levine, Business Statistics – A First Course, Pearson Education, New Delhi.
2. M.L. Berenson and David M. Levine: Basic Business Statistics, PHI, New Delhi.
3. S.C. Gupta: Fundamentals of Statistics, HPH, New Delhi.
4. S.P. Gupta: Statistical Methods, Sultan Chand & Sons, New Delhi.
5. J.K. Sharma: Business Statistics, Pearson Education, New Delhi.
6. Naval Bajapai: Business Statistics, Pearson Education, New Delhi.
7. Shukla & Sahai: Business Statistics, Sahitya Bhavan, Agra.
8. Shenoy and Srivastava: Business Statistics, New Age International, New Delhi.
9. Goel & Goel: Mathematics & Statistics, Taxmann, New Delhi.
10. G.C. Beri: Business Statistics, TMH, New Delhi.