Department of Statistics,
Mahatma Gandhi University
B.Sc (Statistics) Three years paper, credits and marks distribution for theory and practical

B.A/B.Sc. I Year I Semester (CBCS)	Paper-I: Descriptive Statistics and Probability (DSC-2A)	4 HPW with 4 Credits and 100 Marks	Practical Paper – I (with 2 HPW, Credits 2 and Marks 50)
B.A/B.Sc. I Year II Semester (CBCS)	Paper-II: Probability Distributions (DSC-2B)	4 HPW with 4 Credits and 100 Marks	Practical Paper – II (with 2 HPW, Credits 2 and Marks 50)
B.A/B.Sc. II Year III Semester (CBCS)	Examination at the end of II Year III Semester (SEC-1)and Paper-III: Statistical Methods (DSC-2C)	2 HPW with 2 Credits and 50 Marks. 4 HPW with 4 Credits and 100 Marks	No Practical Examination at the end of Semester III) Practical Paper – III (with 2 HPW, Credits 2 and Marks 50)
B.A/B.Sc. III Year IV Semester (CBCS)	Examination at the end of III Year IV Semester (SEC-2) Paper-IV: Inference (DSC-2D)	2 HPW with 2 Credits and 50 Marks. 4 HPW with 4 Credits and 100 Marks	No Practical Practical Paper – IV (with 2 HPW, Credits 2 and Marks 50)
B.A/B.Sc. III Year V Semester (CBCS). Generic Elective-GE-1	Examination at the end of III Year V Semester, SEC-3 Examination at the end of III Year, Semester V Paper-V: Applied Statistics-I (DSC-2E). Examination at the end of III Year V Semester.	2 HPW with 2 Credits and 50 Marks. GE – 1 (with 2 HPW, Credits 2 and Marks 50). 3 HPW with 3 Credits	No Practical No Practical Practical Paper – V (with 2 HPW, Credits 1)

B.A/B.Sc. III Year V Semester (CBCS)	Paper-VI: Elective-II-A(SQC and LPP)(DSE-2E). Paper-VI: Elective-II-B (Bio-Statistics-I)(DSE-2E). Paper-VI: Elective-II-C (Actuarial Statistics-I) (DSE-2E)	3 HPW with 3 Credits. 3 HPW with 3 Credits 3 HPW with 3 Credits.	Practical Paper-VI (Practical using MS-Excel and TORA). Elective-II-A (with 2 HPW, Credits 1) Practical Paper VI – Elective IIB(with 2 HPW, Credits 1) Practical Paper –VI – Elective II-C (with 2 HPW, Credit 1)
B.A/B.Sc. III Year VI Semester (CBCS)	Examination at the end of III Year VI Semester. SEC-4	2 HPW with 2 Credits and 50 Marks	No Practical
Generic Elective-GE-2	Examination at the end of III Year, Semester VI	GE – 2 2 HPW, with Credits 2 and Marks 50	No Practical
B.A/B.Sc. III Year VI Semester (CBCS)	Examination at the end of III Year VI Semester. Paper-VII: Applied Statistics – 2 (DSC-2F) Examination at the end of III Year VI Semester ,Paper-VIII: Elective-II- A (Operations Research) (DSE-2F).	3 HPW with 3 Credits. 3 HPW with 3 Credits.	Examination at the end of Semester VI) Practical Paper – VII(with 2 HPW, 1 Credit) Examination at the end of Semester VI). Practical Paper – VII(with 2 HPW, 1 Credit)
B.A/B.Sc. III Year VI Semester (CBCS)	Examination at the end of III Year VI Semester) Paper-VIII: Elective-II-A (Operations Research)(DSE-2F). Examination at the end of III Year VI Semester) Paper-VIII: Elective-II-B (Bio-Statistics-II) (DSE-2F) Examination at the end of III Year VI Semester) Paper-VIII: Elective-II-C (Actuarial Statistics-II)(DSE-2F)	3 HPW with 3 Credits. 3 HPW with 3 Credits. 3 HPW with 3 Credits.	Examination at the end of Semester VI) Practical Paper-VIII– (Using MS-Excel and TORA). Elective – II-A (with 2 HPW, Credits 1) Examination at the end of Semester VI) Practical Paper-VIII –Elective-II-B (with 2 HPW, 1 Credit). Examination at the end of Semester VI) Practical Paper -VIII–Elective-II-C(with 2 HPW, 1 Credit)

Mahatma Gandhi University
B.A/B.Sc. I Year I Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of I Year I Semester)
Paper-I: Descriptive Statistics and Probability (DSC-2A)
(4 HPW with 4 Credits and 100 Marks)
Unit –I

Descriptive Statistics**:** Concept of primary and secondary data. Methods of collection and editing of primary data.Designing a questionnaire and a schedule.Sources and editing of secondary data.Classification and tabulation of data.Measures of central tendency (mean, median, mode, geometric mean and harmonic mean) with simple applications.Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications.Importance of moments, central and non-central moments, and their interrelationships, Sheppard's corrections for moments for grouped data. Measures of skewness based on quartilesand moments and kurtosis based on moments with real life examples.

UNIT-II

Probability: Basic concepts in probability—deterministic and random experiments, trail, outcome, sample space, event, and operations of events, mutually exclusive and exhaustive events, and equally likely and favourable outcomes with examples. Mathematical, statistical and axiomatic definitions of probability with merits and demerits. Properties of probability based on axiomatic definition. Conditional probability and independence of events.Addition and multiplication theorems for n events.Boole's inequality and Bayes' theorem.Problems on probability using counting methods and theorems**.**

UNIT-III

Random Variables: Definition of random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function with illustrations. Distribution function and its properties.Transformation of one-dimensional random variable (simple 1-1 functions only).Notion of bivariate random variable, bivariate distribution and statement of its properties.Joint, marginal and conditional distributions.Independence of random variables**.**

UNIT-IV

Mathematical Expectation**:** Mathematical expectation of a function of a random variable. Raw and central moments and covariance using mathematical expectation with examples.
Addition and multiplication theorems of expectation.Definition of moment generating function (m.g.f), cumulant generating function (c.g.f), probability generating function (p.g.f) and characteristic function (c.f) and statements of their properties with applications.Chebyshev's , and Cauchy-Schwartz's inequalities and their applications.

List of reference books:

1.Charles M.Grinstead and Laurie Snell,J:Introduction to Probability,American Mathematical Society

2.Willam Feller: Introduction to Probability theory and its applications. Volume –I, Wiley

3.V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi

4. GoonAM,GuptaMK,Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota.

5. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.

6. M.JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.

7. Sanjay Arora and BansiLal:.New Mathematical Statistics : Satya Prakashan , New Delhi

8. Hogg.Tanis.Rao: Probability and Statistical Inference. 7th edition. Pearson

9. SambhavyataAvadhiSiddantalu—TeluguAcademy

10. SahasambandhamVibhajanaSiddantamulu – TeluguAcademy

11. K.V.S. Sarma: Statistics Made Simple: do it yourself on PC. PHI

12. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury, Thomson Learning.

13. Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel 4th edition. Pearson Publication.

14. Abraham Kendall and Baker: Discrete Mathematics for Computer Science.

B.A/B.Sc. I Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester I)
Practical Paper – I (with 2 HPW, Credits 2 and Marks 50)

1. Basics of Excel- data entry, editing and saving, establishing and copying formulae, built in Functions in excel, copy and paste and exporting to MS word document. (Not for The Examination).
2. Graphical presentation of data (Histogram, frequency polygon, Ogives).
3. Graphical presentation of data (Histogram, frequency polygon, Ogives) using MS Excel
4. Diagrammatic presentation of data (Bar and Pie).
5. Diagrammatic presentation of data (Bar and Pie) using MS Excel
6. Computation of non-central and central moments – Sheppard's corrections for grouped data.
7. Computation of coefficients of Skewness and Kurtosis – Karl Pearson's and Bowley's β_1 and β_2.
8. Computation of Measures of central tendency, dispersion, Coefficient of Variation and coefficients of Skew -ness, Kurtosis using MS Excel.

Mahatma Gandhi University
B.A/B.Sc. I Year II Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of I Year II Semester)
Paper-II: Probability Distributions (DSC-2B)
(4 HPW with 4 Credits and 100 Marks)

UNIT-I

Discrete distributions**:** Uniform, Bernoulli, Binomial, Poisson, Negative binomial, Geometric and Hyper-geometric(mean and variance only) distributions their applications and uses.

UNIT-II

Properties of these distributions such as m.g.f, c.g.f., p.g.f., c.f., and moments up to fourth order and their real life applications. Reproductive property wherever exists. Binomial approximation to Hyper-geometric, Poisson approximation to Binomial and Negative binomial distributions.

UNIT-III

Continuous distributions: Rectangular and Normal distributions. Normal distribution as a limiting case of Binomial and Poisson distributions. Exponential, Gamma, Beta of two kinds (mean and variance only) and Cauchy (definition and c.f. only) distributions.

UNIT-IV

Properties of these distributions such as m.g.f., c.g.f., c.f., and moments up to fourth order, their real life applications and reproductive property wherever exists.
Statement and applications of weak law of large numbers,Strong law of large numbers and central limit theorem for identically and independently distributed (i.i.d) random variables with finite variance.

List of reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume –I, Wiley
2. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi
3. GoonAM,Gupta MK,Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
4. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
5. M.JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.

6. Sanjay Arora and BansiLal:.New Mathematical Statistics : Satya Prakashan , New Delhi
7. Hogg.Tanis.Rao: Probability and Statistical Inference. 7th edition. Pearson
8. SambhavyataAvadhiSiddantalu—TeluguAcademy
9. SahasambandhamVibhajanaSiddantamulu – TeluguAcademy
10. K.V.S. Sarma: Statistics Made Simple: do it yourself on PC. PHI
11. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury, Thomson Learning.
12. Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel 4th edition. Pearson Publication.
13. Abraham Kendall and Baker: Discrete Mathematics for Computer Science.
14. Charles M.Grinstead and Laurie Snell,J:Introduction to Probability,American Mathematical Society

B.A/B.Sc. I Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester II)
Practical Paper – II (with 2 HPW, Credits 2 and Marks 50)

1. Fitting of Binomial distribution – Direct method.
2. **Fitting of Binomial distribution – Direct method using MS Excel.**
3. Fitting of binomial distribution – Recurrence relation Method.
4. Fitting of Poisson distribution – Direct method.
5. **Fitting of Poisson distribution – Direct method using MS Excel.**
6. Fitting of Poisson distribution - Recurrence relation Method.
7. Fitting of Negative Binomial distribution.
8. Fitting of Geometric distribution.
9. Fitting of Normal distribution – Areas method.
10. Fitting of Normal distribution – Ordinates method.
11. Fitting of Exponential distribution.
12. **Fitting of Exponential distribution using MS Excel**.
13. Fitting of a Cauchy distribution.
14. **Fitting of a Cauchy distribution using MS Excel**.

Mahatma Gandhi University
B.A/B.Sc. II Year III Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of II Year III Semester)
Paper-III: Statistical Methods (DSC-2C)
(4 HPW with 4 Credits and 100 Marks)

Unit –I

Population correlation coefficient and its properties. Bivariate data, scattered diagram, sample correlation coefficient, computation of correlation coefficient for grouped data.
Correlation ratio, Spearman's rank correlation coefficient and its properties. Principle of least squares, simple linear regression,correlation verses regression, properties of regression coefficients.Concepts and computation of Partial and Multiple correlation coefficients (for 3 variables only).

Unit –II

Fitting of quadratic and power curves. Concepts of partial and multiple correlation coefficients (only for three variables). Analysis of categorical data, independence and association and partial association of attributes, various measures of association (Yule's) for two way data and coefficient of contingency (Pearson and Tcherprow), coefficient of colligation**.**

Unit – III

Concepts of population, parameter, random sample, statistic, sampling distribution and standard error. Standard error of sample mean(s) and sample proportion(s). Exact sampling distributions-Statement and properties of $\chi 2$, t and F distributions and their interrelationships. Independence of sample mean and variance in random sampling from normal distributions.

Unit – IV

Point estimation of a parameter, concept of bias and meansquare error of an estimate. Criteria of good estimator- consistency, unbiasedness, efficiency and sufficiency with examples. Statement of Neyman's Factorization theorem, derivations of sufficient statistics in case of Binomial, Poisson, Normal and Exponential (one parameter only) distributions. Estimation by method of moments, Maximum likelihood (ML), statements of asymptotic properties of MLE. Concept of interval estimation. Confidence intervals of the parameters of normal population by Pivot method.

List of Reference Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi
2. Goon AM, Gupta MK,Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd.,Kolakota.
3. Hoel P.G: Introduction to matehematical statistics, Asia Publiushing house.
4 .Sanjay Arora and BansiLal:.New Mathematical Statistics Satya Prakashan , New Delhi
5.Hogg and Craig :Introduction to Mathematical statistics. Prentice Hall
6.Siegal,S.,and Sidney: Non-parametric statistics for Behavioral Science. McGraw Hill.
7GibbonsJ.D and SubhabrataChakraborti: Nonparametric Statistical Inference. Marcel Dekker.
8.ParimalMukhopadhyay: Mathematical Statistics. New Central Book agency.
9.Conover : Practical Nonparametric Statistics. Wiley series.
10.V.K.Rohatgi and A.K.Md.Ehsanes Saleh: An introduction to probability and statistics. Wiley series.
11.MoodAM,GraybillF A,Boe's DC. Introduction to theory of statistics. TMH
12. Paramiteyamariyuaparameteyaparikshalu. Telugu Academy.
13.K.V.S. Sarma: Statistics Made simple do it yourself on PC. PHI
14.Gerald Keller: Applied Statistics with Microsoft excel. Duxbury. Thomson Learning
15.Levin, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel.4th edition. Pearson Publication.
16.Hogg, Tanis, Rao. Probability and Statistical Inference.7th edition. Pearson Publication.
17.Milton and Arnold(fourth Edition):Introduction to Probability and statistics,Tata Mcgraw hill Publication.

B.A/B.Sc. II Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester III)
Practical Paper – III (with 2 HPW, Credits 2 and Marks 50)

1. Generation of random samples from Uniform (0,1), Uniform (a,b) and exponential distributions.
2. Generation of random samples from Normal and Poisson distributions.
3. **Simulation of random samples from Uniform (0,1), Uniform (a,b),Exponential, Normal and Poisson distributions using MS Excel**.
4. Fitting of straight line and parabola by the method of least squares.
5. **Fitting of straight line and parabola by the method of least squares using MS Excel.**
6. Fitting of power curves of the type $y= a x^b$, $y=a b^x$ and $y=a e^{bx}$ by the method of least squares.
7. **Fitting of power curves of the type $y= a x^b$, $y=a b^x$ and $y=a e^{bx}$ by the method of least squares using MS Excel.**
8. Computation of Yule's coefficient of association.
9. Computation of Pearson's, Tcherprows coefficient of contingency.
10. Computation of correlation coefficient and regression lines for ungrouped data.
11. Computation of correlation coefficient, forming regression lines for ungrouped data.
12. Computation of correlation coefficient, forming regression lines for grouped data.
13. **Computation of correlation coefficient, forming regression lines using MS Excel.**
14. Computation of multiple and partial correlation coefficients.
15. **Computation of multiple and partial correlation coefficients using MS Excel.**
16. Computation of correlation ratio

Mahatma Gandhi University
B.A/B.Sc. II Year IV Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of II Year IV Semester)
Paper-IV: Inference (DSC-2D)
(4 HPW with 4 Credits and 100 Marks)

Unit –I

Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests, test function (non-randomized and randomized). Neyman-Pearson's fundamental lemma for Randomized tests. Examples in case of Binomial, Poisson, Exponential and Normal distributions and their powers. Use of central limit theorem in testing.

Unit II

Large sample tests and confidence intervals for mean(s), proportion(s), standard deviation(s), and correlation coefficient(s**).**

Unit – III

Tests of significance based on $\chi 2$, t and F. $\chi 2$-test for goodness of fit and test for independence of attributes. Definition of order statistics and statement of their distributions.

Unit – IV

Non-parametric tests- their advantages and disadvantages, comparison with parametric tests. Measurement scale- nominal, ordinal, interval and ratio. One sample runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test, Wald Wolfowitz's runs test**.**

List of Reference Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi
2. Goon AM, Gupta MK,Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd.,Kolakota.
3. Hoel P.G: Introduction to matehematical statistics, Asia Publiushing house.
4 .Sanjay Arora and BansiLal:.New Mathematical Statistics Satya Prakashan , New Delhi
5.Hogg and Craig :Introduction to Mathematical statistics. Prentice Hall
6.Siegal,S.,and Sidney: Non-parametric statistics for Behavioral Science. McGraw Hill.
7GibbonsJ.D and SubhabrataChakraborti: Nonparametric Statistical Inference. Marcel Dekker.

8.ParimalMukhopadhyay: Mathematical Statistics. New Central Book agency.
9.Conover : Practical Nonparametric Statistics. Wiley series.
10.V.K.Rohatgi and A.K.Md.Ehsanes Saleh: An introduction to probability and statistics. Wiley series.
11.MoodAM,GraybillFA,Boe's DC. Introduction to theory of statistics. TMH
12. Paramiteyamariyuaparameteyaparikshalu. Telugu Academy.
13.K.V.S. Sarma: Statistics Made simple do it yourself on PC. PHI
14.Gerald Keller: Applied Statistics with Microsoft excel. Duxbury. Thomson Learning
15.Levin, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel.4th edition. Pearson Publication.
16.Hogg, Tanis, Rao. Probability and Statistical Inference.7th edition. Pearson Publication.
17.Milton and Arnold(fourth Edition):Introduction to Probability and statistics,Tata Mcgraw hill Publication.

B.A/B.Sc. II Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester IV)
Practical Paper – IV (with 2 HPW, Credits 2 and Marks 50)

1. Large sample tests for mean(s), proportion(s), Standard deviation(s) and correlation coefficient.
2. Small sample tests for single mean and difference of means and correlation coefficient.
3. Paired t-test.
4. **Small sample tests for mean(s), paired t-test and correlation coefficient using MS Excel.**
5. Small sample test for single and difference of variances.
6. **Small sample test for single and difference of variances using MS Excel.**
7. $\chi 2$ – test for goodness of fit and independence of attributes.
8. **$\chi 2$ – test for goodness of fit and independence of attributes using MS Excel.**
9. **Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.**
10. Nonparametric tests for two independent samples (Median test,Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's runs test)

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MSWord for writing inferences.

Mahatma Gandhi University
B.A/B.Sc. III Year V Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year V Semester)
Paper-V: Applied Statistics-I (DSC-2E)
(3 HPW with 3 Credits)

Unit –I

Design of Sample Surveys:

Concepts of population, sample, sampling unit, parameter, statistic, sample frame and standard error.

Principal steps in sample surveys - need for sampling, census versus sample surveys, sampling and non- sampling errors, sources and treatment of non-sampling errors, advantages and limitations of sampling.

Types of sampling: Subjective, probability and mixed sampling methods.

Methods of drawing random samples with and without replacement.Estimates of population mean, total, and proportion, their variances and the estimates of variances in the following methods.

(i) SRSWR and SRSWOR

(ii) Stratified random sampling with proportional and Neyman allocation, and

(iii) Systematic sampling when N= nk.

Comparison of relative efficiencies.Advantages and disadvantages of above methods of sampling.

Unit –II

Time series: -Time series and its components with illustrations, additive, multiplicative and mixed models. Determination of trend by least squares, moving average methods. Growth curves and their fitting with reference to Modified exponential, Gompertz and Logistic curves.

Determination of seasonal indices by Ratio to moving average, ratio to trend and link relative methods.

Unit –III

Index Numbers: -Concept, construction, uses and limitations of simple and weighted index numbers. Laspeyer's, Paasche's and Fisher's index numbers, criterion of a good index numbers, problems involved in the construction of index numbers.Fisher's index as ideal index number. Fixed and chain base index numbers. Cost of living index numbers and wholesale price index numbers.Base shifting, splicing and deflation of index numbers.

List of reference books:

1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand
2. ParimalMukhopadhyay : Applied Statistics . New Central Book agency.

3. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs.Wiley Eastern.
4. M.R.Saluja : Indian Official Statistics. ISI publications.
5. B.L.Agarwal: Basic Statistics.New Age publications.
6. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
7. PratirupaSidhanthamulu – Telugu Academy.
8. PrayogaRachana and Visleshana – Telugu Academy.
13. K.V.S. Sarma: Statistics made simple : do it yourself on PC. PHI
14.Gerald Keller; Applied Statistics with Microsoft excel. Duxbury.Thomson Learning.
15Levine, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel. Pearson Publication..
16. AnuvartitaSankhyakasastram – Telugu Academy.
17. Arora, SumeetArora,S.Arora: Comprehensive Statistical Methods. S.Chand.
18. A.M.Goon,M.K.Gupta,B.Dasgupta Fundamentals of Statistics Vol II World Press Private Ltd.,Calcutta
19. A.M.Goon,M.K.Gupta,B.Dasgupta An outline of Statistical Theory Vol II World Press Private Ltd.,Calcutta17.

B.A/B.Sc. II Year: Statistics Syllabus

(With Mathematics Combination)
(Examination at the end of Semester V)
Practical Paper – V (with 2 HPW, Credits 1)

Sampling Techniques:

1. Estimation of Population mean, population total and variance of these estimates by
2. Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR
3. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR
4. Systematic sampling with N = nk. Comparison of Systematic sampling with Stratified and SRSWOR

Time Series Analysis

5 Measurement of trend by method of least squares and moving averages.
6. Determination of seasonal indices by the method of Ratio to moving averages.
7. Determination of seasonal indices by the method of Ratio to trend.
8. Determination of seasonal indices by the method of link Relatives.

Index Numbers

9. Computation of all weighted indices.
10. Computation of Cost of living index number.
11. Base shifting, splicing and Deflation.

Statistical Quality Control

1. Construction of $\bar{x}$, **R** and σ- charts.
2. Construction of p and np charts with fixed n.
3. Construction of p and np charts with varying n.
4. Construction of c and u charts.
5. Construction of OC and ASN curves for single and double sampling plan.

Operations Research:

6. Solution of L.P. problem by Graphical method.
7. Solution of L.P. problem by simplex method.
8. Solution of L.P. problem by Big-M and two-phase simplex method.

B.A/B.Sc. III Year V Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year V Semester)
Paper-VI: Elective-II-A(SQC and LPP)(DSE-2E)
(3 HPW with 3 Credits)

Unit – I

Statistical Quality Control

Importance of SQC in industry. Statistical basis of Shewhart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p , np, and c- charts with fixed and varying sample sizes). Interpretation of control charts.

Unit – II

Natural tolerance limits and specification limits, process capability index. Concept of Six sigma and its importance.

Acceptance sampling plans:. Concept of AQL and LTPD.Producers risk and consumer's risk Single and Double sampling plans for attributes and their OC and ASN functions. Design of single and double sampling plans for attributes using Binomial and Poisson distributions

Unit – III

Linear Programming:

Meaning and scope of OR. Convex sets and their properties.Definition of general LPP. Formulation of LPP.Solution of LPP by graphical method.Fundamental theorem of LPP.Simplex algorithm.Concept of artificial variables. Big –M /Penalty method and two-phase simplex methods. Concept of degeneracy and resolving it, Concept of duality, duality as LPP.Dual Primal relationship.

List of reference books

1. KantiSwaroop,P.K.Gupta and ManMohan: Operations Research. Sultan Chand.
2. D.C.Montgomary: Introduction to Statistical Quality Control. Wiley
3. V.K.Kapoor and S.C.Gupta L Fundamentals of Applied Statistics. Sultan Chand
4. Gass: Linear Programming. Mc Graw Hill.
7. Hadley : Linear programming. Addison-Wesley.
8. Wayne L. Winston : Operations Research. Thomson, India edition.4th edition.
9. ParimalMukhopadhyay : Applied Statistics . New Central Book agency
10. AnuvartitaSankhyakasastram – Telugu Academy.
11. R.C.Gupta: Statistical Quality Control.
12. Taha : Operations Research: An Introduction : Mac Millan.
13. ParikriyaParishodhana - Telugu Academy.
14. O.R.Models and Methods by Chandrasekhar Salimath and Bhupender Parashar,Univ.Press

B.A/B.Sc. III Year: Statistics Syllabus

(With Mathematics Combination)
(Examination at the end of Semester V)
Practical Paper-VI (Practical using MS-Excel and TORA)
Elective-II-A (with 2 HPW, Credits 1)

Time Series Analysis

1. Measurement of trend by method of least squares and moving averages.

2. Determination of seasonal indices by the method of Ratio to moving averages.
3. Determination of seasonal indices by the method of Ratio to trend.
4.. Determination of seasonal indices by the method of link Relatives.

Index Numbers

5. Computation of all weighted indices.
6. Computation of Cost of living index number.
7.. Base shifting, splicing and Deflation.

Statistical Quality Control

8 Construction of $\bar{x}$, **R** and σ- charts.
9. Construction of p and np charts with fixed n.
10. Construction of p and np charts with varying n.
11. Construction of c and u charts.
12. Construction of OC and ASN curves for single and double sampling plan.

Operations Research:

13. Solution of L.P. problem by Graphical method.
14. Solution of L.P. problem by simplex method.
15. Solution of L.P. problem by Big-M and two-phase simplex method.

Note 1: The Practical paper VI includes I and II semesters MS-Excel Practical's for examination.

Note 2: The question paper consists of TWO sections. Section A Consists of 3 Questions from Semester I And II. Section B consists of 3 questions from Semester V.

Mahatma Gandhi University
B.A/B.Sc. III Year V Semester (CBCS): Statistics Syllabus

(With Mathematics Combination)
(Examination at the end of III Year V Semester)
Paper-VI: Elective-II-B(Bio-Statistics-I)(DSE-2E)
(3 HPW with 3 Credits).

Unit – I

Bioassay

The purpose and structure of biological assay. Types of biological assays, direct assays, Ratio estimates, asymptotic distributions: Feller's theorem. Regression approach to estimating dose-response, relationships,

Unit – II

Logit and Probit approaches when dose-response curve for standard preparation is unknown, quantal responses, methods of estimation of parameters, estimation of extreme quantiles, dose allocation schemes, polychotomous quantal response, estimation of points on the quantal response function**.**

Unit – III

Statistical Genetics

Basic terminology of genetics.Frequencies of genes and genotypes, Mendal's law, Hardy-Weinberg equilibrium.Mating Frequencies, estimation of allele frequency (dominant /co dominant cases).Multiple alleles.

Approach to equilibrium for X-linked gene, natural selection, mutation, genetic drift, equilibrium when both natural selection and mutation are operative**.**

List of reference books:

1.D.J.Finney (1970): Statistical methods in Biological Assay. Charles Griffin.
2.Z.Govindarajulu (2000): Statistical Techniques in Bioassay. Karger Publishers/Panther Publishers.
3.C.C.Li (1976): First course in population genetics. Boxwood press, California.
4. Falcon and Mackay (1998) : Introduction to quantitative genetics. Longman
5.Cox.D.R. andOakes.D (1984): analysis of survival data. Chapman and Hall.
6.Miller, R.G. (12981): Survival analysis. John wiley.
7. Anil gore and S.A.Paranjpe (2000). A course in mathematical and statistical ecology. KulwerAcademic Publishers.
8. Rielon E.C (1977): An introduction to Mathematical Ecology. Wiley.
9. J.F.Lawless: Statistical models and methods of life data. Wiley.
10. James F Crow and Motoo Kimura: An Introduction to Population Genetics Theory. Alpha edition.

B.A/B.Sc. III Year: Statistics Syllabus
(With Mathematics Combination)

(Examination at the end of Semester V)
Practical PaperVI – Elective-II-B (with 2 HPW, Credits 1)

1. Estimation of relative potency and its standard error.
2.Fitting exponential growth model to data by linearization method.
3. Fitting logistic growth model.
4. Dose response relation and its estimation by least squares method.
5. Dose response relation and estimation by MLE method.
6. Estimation of extreme quantiles.
7. Estimation of points on the quantal response.
8. Hardy –Weinberg equilibrium frequencies.
9. Estimation of allele frequencies.
10. Effects of mutation and selection.

The above practical are to be carried out using MS Excel and Manually.

Note: Training shall be in establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS Word for writing inference.

(With Mathematics Combination)
(Examination at the end of III Year V Semester)
Paper-VI: Elective-II-C (Actuarial Statistics-I) (DSE-2E)
(3 HPW with 3 Credits).

Unit –I.

Utility theory, insurance and utility theory, models for individual claims and their sums, survival function, curate future lifetime, force of mortality.

Unit –II.

Life table and its relation with survival function examples, assumptions of fractional ages, some analytical laws of mortality select and ultimate tables**.**

Unit – III

Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions, evaluation for special mortality laws.
Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations.

List of Reference books:

1. N.L.Bowers, H.U.Gerber, J.C.Hickman, D.A.Jones and C.J.Nesbitt (1986): Actuarial Mathematics, Society of Actuaries, Ithaca, Illinois,USA .
2. Neill,A.(1977): Life contingencies, Heineman.
3. Spurgeon E.T.(1972): Life contingencies, Cambridge University Press
4. Benjamin,B and Pollard,J.H(1980): Analysis of Mortality and other Actuarial Statistics.
5. Federation of Insurance Institutes study courses: mathematical basis of Life Assurance F.I.21 (Published by Federation if Insurance Institutes, Bombay).

B.A/B.Sc. III Year: Statistics Syllabus
(With Mathematics Combination)

(Examination at the end of Semester V)
Practical Paper –VI – Elective-II-C (with 2 HPW, Credit 1)

1. Computation of values of utility function.
2. Computation of various components of life tables.
3. Construction of multiple decrement table for deterministic survival group.
4. Determination of distribution function, survival function and force of mortality.
5. Construction of multiple decrement table for random survivorship group.

The above practical are to be carried out using MS Excel and Manually.

Note: Training shall be in establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS Word for writing inference.

B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VII: Applied Statistics – 2 (DSC-2F)
(3 HPW with 3 Credits)
Unit –I

Analysis of Variance and Design of Experiments

Statement of Cochran's theorem, ANOVA – one-way, two-way classifications with one observation per cell Expectation of various sums of squares, Statistical analysis, Importance and applications of design of experiments. Principles of experimentation,Concept of Gauss-Markoff linear model with examples, Analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Comparison of the efficiencies of above designs.

Unit –II

Vital statistics: Introduction, definition and uses of vital statistics. Sources of vital statistics, registration method and census method. Rates and ratios, Crude death rates, age specific death rate, standardized death rates, crude birth rate, age specific fertility rate, general fertility rate, total fertility rate. Measurement of population growth, crude rate of natural increase- Pearl's vital index. Gross reproductive rate sand Net reproductive rate, Life tables, construction and uses of life tables and Abridged life tables.

Unit –III

Demand Analysis: Introduction. Demand and supply, price elasticity of supply and demand. Methods of determining demand and supply curves, Leontief's ,Pigous's methods of determining demand curve from time series data, limitations of these methods Pigou's method from time series data. Pareto law of income distribution curves of concentration.
Official Statistics: - Functions and organization of CSO and NSSO. Agricultural Statistics, area and yield statistics. National Income and its computation, utility and difficulties in estimation of national income.

List of reference books:

1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand
2. ParimalMukhopadhyay : Applied Statistics . New Central Book agency.
3. M.R.Saluja : Indian Official Statistics. ISI publications.
4. B.L.Agarwal: Basic Statistics.New Age publications.
5. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
6. PratirupaSidhanthamulu – Telugu Academy.
7. PrayogaRachana and Visleshana – Telugu Academy.

B.A/B.Sc. III Year: Statistics Syllabus

(With Mathematics Combination)
(Examination at the end of Semester VI)
Practical Paper – VII(with 2 HPW, 1 Credit)

Designs of Experiments

1. Analysis of CRD
2. Analysis of RBD with and without missing observation. Comparison of RBD with CRD
3. Analysis of LSD with and without missing observation. Comparison of LSD with RBD and CRD

Vital Statistics

4. Computation of Morality rates, Fertility rates and Reproduction rates.
5. Construction of life tables and abridged life tables.

Demand Analysis

6. Construction of Lorenz curve.
7. Fitting of Pareto law to an income data.

Operations Research and Reliability

1. Optimum solution to balanced and unbalanced transportation problem using North-West corner rule, Matrix minimum method and Vogel's approximation method for IBFS.

2. Solution of Assignment problem for both maximization and minimization

3.Solution of travelling salesman problem.

4. Computation of Optimal Sequence and idle time for N jobs on 2 and 3 machines.

5. Computation of System reliability for series, parallel and K out of N systems.

B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VIII: Elective-II-A (Operations Research)(DSE-2F)
(3 HPW with 3 Credits).

Unit-I

Transportation Problem:

Definition of transportation problem, TPP as a special case of LPP, Initial basic feasible solutions by North-West Corner Rule, Matrix minimum methods and VAM. Optimal solution through MODI tableau and stepping stone method for balanced and unbalanced transportation problem.
Degeneracy in TP and resolving it. Concept of Transshipment problem.

Unit-II

Assignment Problem:

Formulation and description of Assignment problem and its variations. Assignment problem as special case of TP and LPP. Unbalanced assignment problem, traveling salesman problem. Optimal solution using Hungarian method.

Unit-III

Sequencing Problems:

Problem of Sequencing. Optimal sequence of N jobs on two and three machines without passing.

Reliability: Introduction. Hazard function, Exponential distribution as life model, its memory-less property.Reliability function and its estimation.System reliability - series, parallel and k out of N systems and their reliabilities.

List of reference books

1. KantiSwaroop,P.K.Gupta and ManMohan: Operations Research. Sultan Chand.
2. S.K.Sinha: Reliability and life testing. Wiley Eastern
3. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.
4. Wayne L. Winston : Operations Research. Thomson, India edition.4th edition.
5. Taha : Operations Research: An Introduction : Mac Millan.
6. O.R.Models and Methods by Chandrasekhar Salimath and BhupenderParashar University Press.

B.A/B.Sc. II Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester VI)
Practical Paper-VIII– (Using MS-Excel and TORA)
Elective – II-A (with 2 HPW, Credits 1)

Designs of Experiments

1. Analysis of CRD
2. Analysis of RBD with and without missing observation. Comparison of RBD with CRD
3. Analysis of LSD with and without missing observation. Comparison of LSD with RBD and CRD

Vital Statistics

4. Computation of Morality rates, Fertility rates and Reproduction rates.
5. Construction of life tables and abridged life tables.

Demand Analysis

6. Construction of Lorenz curve.
7. Fitting of Pareto law to an income data.

Operations research and Reliability:

1. Optimum solution to balanced and unbalanced transportation problem using North-West corner rule, Matrix minimum method and Vogel's approximation method for IBFS.

2. Solution of Assignment problem for both maximization and minimization

3.Solution of travelling salesman problem.

4. Computation of Optimal Sequence and idle time for N jobs on 2 and 3 machines.

4. Computation of System reliability for series, parallel and K out of N systems.

Note 1: The Practical paper VIII includes III and IV semesters MS-Excel Practical's for examination.

Note 2: The question paper consists of TWO sections. Section A Consists of 3 Questions from Semester III And IV. Section B consists of 3 questions from Semester VI.

Mahatma Gandhi University
B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VIII: Elective-II-B (Bio-Statistics-II) (DSE-2F)
(3 HPW with 3 Credits).

Unit – I

Survival Analysis

Survival functions and hazard rates. Types of censoring and likelihood in these cases. Life distributions- Exponential, Gamma, Weibull, Lognormal, Pareto. Linear failure rate. Point estimation, confidence intervals, scores, likelihood ratio, MLE, tests for these distributions.

Unit – II

Life Tables and ageing Process

Life tables, failure rates, mean residual life and their elementary properties, Ageing classes and their properties, Bathtub failure rate. Estimation of survival function.
Acturial estimator, Kaplan-Meier estimator, estimation under the assumption of IFR/ DFR.Tests of exponentiality against nonparametric classes, total time on test.

Unit – III

Quantitative Epidemiology

Introduction to modern epidemiology, principles of epidemiological investigation, surveillance and disease monitoring in populations.
Epidemiologic measures: Organizing and presenting epidemiologic data, measures of disease frequency, measures of effect and association, causation and casual inference. Design and analysis of epidemiologic studies.

List of reference books:

1. Cox.D.R. and Oakes.D (1984): analysis of survival data. Chapman and Hall.
2. Miller, R.G. (12981): Survival analysis. John wiley.
3. Anil gore and S.A.Paranjpe (2000). A course in mathematical and statistical ecology. KulwerAcademic Publishers.
4. Rielon E.C (1977): An introduction to Mathematical Ecology. Wiley.
5. J.F.Lawless: Statistical models and methods of life data. Wiley.
6. James F Crow and Motoo Kimura: An Introduction to Population Genetics Theory.

B.A/B.Sc. III Year: Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of Semester VI)
Practical Paper-VIII –Elective- II-B (with 2 HPW, 1 Credit)

1. Selection and the Hardy -Weinberg test.
2. Genetic drift.
3. Parameter estimation in exponential and Weibull distributions—Type-I, Type-II Censoring.
4. LR tests for exponential and Weibull distribution.
5. Actuarial method of estimation.
6. Kaplan-Meier estimator.

The above practical are to be carried out using MS Excel and Manually.

Note: Training shall be in establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS Word for writing inference.

Mahatma Gandhi University
B.A/B.Sc. III Year VI Semester (CBCS): Statistics Syllabus
(With Mathematics Combination)
(Examination at the end of III Year VI Semester)
Paper-VIII: Elective-II-C (Actuarial Statistics-II)(DSE-2F)
(3 HPW with 3 Credits)

Unit –I

Elements of compound interest (nominal and effective rate of interest)
Life annuities: single payment, continuous life annuities, discrete life annuities, life annuities with monthly payments, communication functions, varying annuities, recursions and complete annuities- immediate and apportionable annuities – due.

Unit – II

Net premiums: Continuous and discrete premiums, true monthly payment premiums, apportionate premiums, commutation functions, and accumulation type benefits.

Unit - III

Net premium reserves: continuous and discrete net premium reserve, reserves on a semi continuous basis, reserves based on true monthly premiums, reserves on an apportionable or accounted continuous basis reserves at fractional durations.

List of Reference books:

1. N.L.Bowers, H.U.Gerber, J.C.Hickman, D.A.Jones and C.J.Nesbitt (1986): Actuarial Mathematics, Society of Actuaries, Ithaca, Illinois,USA .
2. Neill,A.(1977): Life contingencies, Heineman.
3. Spurgeon E.T.(1972): Life contingencies, Cambridge University Press
4. Benjamin,B and Pollard,J.H(1980): Analysis of Mortality and other Actuarial Statistics.
5. Federation of Insurance Institutes study courses: mathematical basis of Life Assurance F.I.21 (Published by Federation if Insurance Institutes, Bombay).

B.A/B.Sc. III Year: Statistics Syllabus

(With Mathematics Combination)
(Examination at the end of Semester VI)
Practical Paper -VIII–Elective- II-C(with 2 HPW, 1 Credit)

1. Computation of compound interest (nominal and effective rate of interests).
2. Annuities and annuity dues.
3. Computation of discrete and continuous net premiums.
4. Annuities payable more frequently than one year.
5. Complete and special annuities.
6. Office premium a.
7. Assurances payable at the moment of death.

The above practical are to be carried out using MS Excel and Manually.

Note: Training shall be in establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS Word for writing inference.