**VIKRAMA SIMHAPURI UNIVERSITY**
**Common Framework of CBCS for Colleges in Andhra Pradesh**
(A.P. State of Council of Higher Education)

# B.A/B.Sc. Statistics (With Mathematics) Core Syllabus under CBCS   w.e.f. 2020-21

## Structure of Statistics (With Mathematics)

### B.Sc. STATISTICS (With Mathematics)

| Sem | Paper | Title of the Course | Credits | Hrs | Marks | | |
|-----|-------|---------------------|---------|-----|-----|------|-------|
| | | | | | Int | Univ | Total |
| I | I | Descriptive Statistics | 4 | 4 | 25 | 75 | 100 |
| | | Practical-1 | 1 | 2 | | 50 | 50 |
| II | II | Probability Theory And Distributions | 4 | 4 | 25 | 75 | 100 |
| | | Practical-II | 1 | 2 | | 50 | 50 |
| III | III | Statistical Inference | 4 | 4 | 25 | 75 | 100 |
| | | Practical-III | 1 | 2 | | 50 | 50 |
| IV | IV | Sampling Techniques And Design of Experiments | 4 | 4 | 25 | 75 | 100 |
| | | Practical-1V | 1 | 2 | | 50 | 50 |
| IV | V | Applied statistics | 4 | 4 | 25 | 75 | 100 |
| | | Practical-V | 1 | 2 | | 50 | 50 |

## OBJECTIVE OF THE COURSE

Statistics is a key to success in the field of science and technology. Today, the students need a thorough knowledge of fundamental basic principles, methods, results and a clear perception of the power of statistical ideas and tools to use them effectively in modeling, interpreting and solving the real life problems. Statistics plays an important role in the context of globalization of Indian economy, modern technology, computer science and information technology.

*The main objectives of the course are*

- To build the basis for promoting theoretical and application aspects of statistics.

- To underline the statistics as a science of decision making in the real life problems with the description of uncertainty.

- To emphasize the relevance of statistical tools and techniques of analysis in the study of interdisciplinary sciences.

- To acquaint students with various statistical methods and their applications in different fields.

- To cultivate statistical thinking among students.

- To develop skills in handling complex problems in data analysis and research design.

- To prepare students for future courses having quantitative components.


This course is aimed at preparing the students to hope with the latest developments and compete with students from other universities and put them on the right track.

## PAPER WISE OBJECTIVES

### PAPER-I: Descriptive Statistics

- The objective of this paper is to throw light on the role of statistics in different fields with special reference to business and economics.

- It gives the students to review good practice in presentation and the format most applicable to their own data.

- The measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.

- The measures of dispersion throw light on reliability of average and control of variability

- The concept of Correlation and Linear Regression deals with studying the linear relationship between two or more variables, which is needed to analyze the real life problems.

- The attributes gives an idea that how to deal with qualitative data.

### PAPER-II: Probability Theory and Distributions

- This paper deals with the situation where there is uncertainty and how to measure that uncertainty by defining the probability, random variable and mathematical expectation which are essential in all research areas.

- This paper gives an idea of using various standard theoretical distributions, their chief characteristics and applications in analyzing any data.

**PAPER-III: Statistical Inference**

- This paper deals with standard sampling distributions like Chi Square, t and F and their characteristics and applications.

- This paper deals with the different techniques of point estimation for estimating the parameter values of population and interval estimation for population parameters.

- In this paper, various topics of Inferential Statistics such as interval estimation, Testing of Hypothesis, large sample tests (Z-test), small sample tests (t-test, F-test, chi-square test) and non-parametric tests are dealt with. These techniques play an important role in many fields like pharmaceutical, agricultural, medical etc.

**PAPER-IV: Sampling Techniques and Design of Experiments**

- The sampling techniques deals with the ways and methods that should be used to draw samples to obtain the optimum results, i.e., the maximum information about the characteristics of the population with the available sources at our disposal in terms of time, money and manpower to obtain the best possible estimates of the population parameters

- This paper throw light on understanding the variability between group and within group through Analysis of Variance

- This gives an idea of logical construction of Experimental Design and applications of these designs now days in various research areas.

- Factorial designs allow researchers to look at how multiple factors affect a dependent variable, both independently and together.

**PAPER-V: Applied Statistics**

- This paper deals the time series on simple description methods of data, explains the variation, forecasting the future values, control procedures.

- It gives an idea of using index numbers in a range of practical situations, limitations and uses

- The vital statistics enlighten the students in obtaining different mortality, fertility rates thus obtaining the population growth rates and construction and use of life tables in actuarial science.

**B.A/B.Sc., STATISTICS** *(WITH MATHMATICS)*
**REVISED SYLLABUS**
**CBCS/SEMESTER SYSTEM** *(W.E.F 2020-21 ADMITTED BATCH)*
**SEMESTER – I**
**PAPER - I: DESCRIPTIVE STATISTICS**

## UNIT-I

**Introduction to Statistics**: Importance of Statistics. Scope of Statistics in different fields. Concepts of primary and secondary data. Measures of Central Tendency:  Mean, Median, Mode, Geometric Mean and Harmonic Mean

## UNIT-II

**Measures of Dispersion**: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non-Central moments and their interrelationship. Sheppard's correction for moments. Skewness and kurtosis.

## UNIT-III

**Curve fitting**: Bi- variate data, Principle of least squares, fitting of $n^{th}$ degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, Fitting of power curve and exponential curves.

**Correlation:** Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties). Concept of multiple and partial correlation coefficients

## UNIT-IV

**Regression :**Concept of Regression, Linear Regression: Regression lines, Regression coefficients and it's properties, Regressions lines for bi-variate data and simple problems. Correlation vs regression.

## UNIT-V

**Attributes :**Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only , Independence of attributes , Association of attributes and its measures, Relationship between association and colligation of attributes, Contingency table: Square contingency**,** Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.

**Text Books:**

1.  V.K.Kapoor and S.C.Gupta:  Fundamentals of Mathematical Statistics, Sulthand& Sons, New Delhi.

2.  BA/BSc I year statistics - descriptive statistics, probability distribution – Telugu Academy- Dr M.JaganmohanRao, Dr. N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt. D.Vijayalakshmi.

3.  K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

**Reference books:**

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

2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World  Press Pvt.Ltd., Kolakota.

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

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

5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , New Delhi

## Practicals - Paper – I

**Note:  Minimum of 10 practicals should be done**

1. Graphical presentation of data (Histogram, frequency polygon, Ogives).
2. Diagrammatic presentation of data (Bar and Pie).
3. Computation of measures of central tendency(Mean, Median and Mode)
4. Computation of measures of dispersion(Q.D, M.D and S.D)
5. Computation of non-central, central moments, $\beta_1$ and $\beta_2$ for ungrouped data.
6. Computation of non-central, central moments, $\beta_1$ and $\beta_2$ and Sheppard's corrections for grouped data.
7. Computation of Karl Pearson's coefficients of Skewness and Bowley's coefficients of Skewness.
8. Fitting of straight line  by the method of least squares
9. Fitting of parabola by the method of least squares
10. Fitting of power curve of the type by the method of least squares.
11. Fitting of exponential curve of the type and by the method of least squares.
12. Computation of correlation coefficient and regression lines
13. Computation of Rank correlation coefficient
14. Computation of Yule's coefficients of association
15. Computation of Coefficients of Contingency

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

### Course Learning Outcomes

Students will acquire

1) knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.

2) knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion etc.

3) knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes,

4) insights into preliminary exploration of different types of data.

5) Knowledge of correlation, regression analysis, regression diagnostics, partial and multiple correlations.

**THREE YEAR B.A./B.Sc DEGREE EXAMINATION**
**STATISTICS(WM)**
**(W.E.F 2020-21 ADMITTED BATCH)**
**SEMESTER – I**
**PAPER 1: DESCRIPTIVE STATISTICS**

**Time: 3 Hours**                                **Max. Marks :75**

**SECTION – A**

**Answer any <u>FIVE</u> Questions :-**                        **5 X 5 = 25M**

1. Define Primary and Secondary data
2. Define mean and explain merits and demerits
3. Explain sheppard corrections for moments
4. Define Skewness? Mention various measures of Skewness?
5. Explain the Method of Fitting of Power Curve
6. Define Multiple & Partial Correlation Coefficients
7. Define Regression Coefficients? Mention the Properties.
8. What are the differences between Correlation & Regression?
9. What are the Conditions of Consistency of Two Attributes data.
10. Explain Independence of Attributes .

**SECTION – B**

   **Answer any FIVE questions :-**                      **5 X 10 = 50M**

11. Explain various measures of Central tendency.
12. Find Mean, Median for the following data

| C.I | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 |
|-----|------|-------|-------|-------|--------|
| f | 15 | 23 | 50 | 25 | 10 |

13. Explain various measures of dispersion. State their merits and demerits.
14. Define central, non-central moments. Derive central moments in terms of raw moments.
15. Explain Fitting of a Second degree Parabola by Least Squares Method:     Fit Parabola for the following data.

| X | 1960 | 1970 | 1980 | 1990 | 2000 |
|---|------|------|------|------|------|
| Y | 20 | 35 | 55 | 80 | 115 |

16. Define Karl Pearson Correlation Coefficient. State and prove the Properties of Correlation Coefficient
17. Derive regression line of Y on X .
18. The equations of the two regression lines are 8x-10y+66=0, 40x-18y+214=0 and v(x)=9, then find (a) Correlation Coefficient (b)S.D of y
19. Explain Yules Coefficient of Assocciation and Colligation and Show that $Q=2Y/(1+Y^2)$
20. Explain Various Coefficients of Contingency.

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**SEMESTER – II**

PAPER - II: **PROBABILITY THEORY AND DISTRIBUTIONS**

### UNIT-I

**Introduction to Probability**: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events. Boole's inequality and Baye's theorem

### UNIT-II

**Random variable**: Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. For a given pmf, pdf calculation of Mean and Variance. Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables

### UNIT- III

**Mathematical expectation** : Mathematical expectation of a random variable and function of a random variable. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Definitions of M.G.F, C.G.F, P.G.F, C.F and their properties (Derivations not required).

Chebyshev and Cauchy – Schwartz  inequalities.

### UNIT-IV

**Discrete Distributions**: Binomial, Poisson, Negative Binomial, Geometric distributions: Definitions, means, variances, M.G.F, C.F, additive property if exists. Possion approximation to Binomial distribution. Hyper-geometric distribution: Definition, mean.

### UNIT - V

**Continuous Distributions**: Rectangular, Exponential, Gamma, Beta Distributions: mean,variance, M.G.F, C.F. **Normal Distribution**: Definition, Importance, Properties, M.G.F, CF, additive property.

**Text Books:**

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy- Dr M.JaganmohanRao,DrN.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi.
3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

**Reference books:**

1. Willam Feller: Introduction to Probability theory and its applications. Volume – I, Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
4. M. JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , New Delhi 6.Hogg Tanis Rao: Probability and Statistical Inference. 7th edition. Pearson.

# Practicals Paper – II

1. Fitting of Binomial distribution – Direct method.
2. Fitting of binomial distribution – Recurrence relation Method.
3. Fitting of Poisson distribution – Direct method.
4. Fitting of Poisson distribution - Recurrence relation Method.
5. Fitting of Negative Binomial distribution.
6. Fitting of Geometric distribution.
7. Fitting of Normal distribution – Areas method.
8. Fitting of Normal distribution – Ordinates method.
9. Fitting of Exponential distribution.

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

## Course Learning Outcomes

Students will acquire

1) ability to distinguish between random and non-random experiments,

2) knowledge to conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem,

3) knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments,

4) knowledge of important discrete and continuous distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions, (e) acumen to apply standard discrete and continuous probability distributions to different situations.

**THREE YEAR B.A./B.Sc DEGREE EXAMINATION**
**STATISTICS(WM)**
**(W.E.F 2020-21 ADMITTED BATCH)**
**SEMESTER – II**
**PAPER 2: PROBABILITY THEORY AND DISTRIBUTIONS**

**Time: 3 Hours**                                                    **Max. Marks : 75**

## SECTION – A

Answer any <u>FIVE</u> Questions :-                                    5 X 5 = 25 M

1. Define (a) Random experiment (b) Sample Space.(c) Events
2. State and Prove Boole's Inequality
3. Define (a) pdf (b) pmf
4. If the pdf of x is  f(x)= x, 0<x<2 then find E(x), V(x)
5. Define Mathematical Expectation. Mention the Properties.
6. Define mgf, cgf, cf of a Random variable.
7. Define poisson distribution. Find its mean.
8. Define Geometric distribution. Mention the properties.
9. Define Rectangular distribution. Find its mean.
10. Derive additive property of Normal distribution

## SECTION – B

**Answer any FIVE  Questions.**                                    **5 X 10 = 50 M**

**11.**   Explain various definitions of Probability
**12.**   State and prove Multiplication theorem of Probability for n events
**13.**   Explain Distribution Function and its properties.
14.   Define the Concepts (a)Joint pdf (b) Marginal pdf (c) Conditional pdf (d) Independence of Random variables
15.   State and Prove Chebychev's Inequality.
16.   State and Prove Multiplication theorem on Mathematical Expectation.
17.   Define Bionomial distribution and derive its mean and variance.
18.   Derive Poisson distribution as a limiting case of Binomial distribution.
19.   Define Normal distribution.Mention the Properties and Importance of Normal distribution.
20.   Define Gama distribution, find MGF of Gama distribution.

## UNIT-I

**Concepts**: Population, Sample, Parameter, statistic, Sampling distribution, Standard error. Central limit theorem (statement only). Student's t- distribution, F – Distribution, $\chi^2$-Distribution: Definitions, properties and their applications (No need of derivatiions)

## UNIT-II

**Theory of estimation:** Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, &sufficiency and Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's. Binomial, Poisson & Normal Population parameters estimate by MLE method. Confidence Intervals.

## UNIT-III

**Testing of Hypothesis:** 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. Neyman-Pearson's lemma. Examples in case of Binomial, Poisson, Normal distributions.

## UNIT – IV

**Large sample Tests:** Large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions, Standard deviation(s) and Correlation coefficient(s)**.**

**Small Sample tests:**  t-test for single Mean, difference of Means and Paired t-test. 2-test for Goodness of fit and Independence of attributes. F-test for Equality of variances.

## UNIT – V

**Non-parametric tests**- Definition, advantages and disadvantages, comparison with Parametric tests. Measurement scale- nominal, ordinal, interval and ratio. Sign, Run, Median tests  for two Large Samples only.

**TEXT BOOKS**

1. BA/BSc II year statistics - statistical methods and inference – Telugu Academy by A.Mohanrao, N.Srinivasa Rao, Dr R.Sudhakar Reddy, Dr T.C. Ravichandra Kumar.
2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.

**REFERENCE BOOKS:**

1. Fundamentals of Mathematics statistics : VK Kapoor and SC Guptha.
2. Outlines of statistics, Vol II : Goon Guptha, M.K.Guptha, Das Guptha B.
3. Introduction to Mathematical Statistics :Hoel P.G.
4. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition. Pearson.

# Practicals - Paper –III

**Note: Minimum of 10 practicals should be done**

1. Large sample test for single mean
2. Large sample test for difference of means
3. Large sample test for single proportion
4. Large sample test for difference of proportions
5. Large sample test for difference of standard deviations
6. Large sample test for correlation coefficient
7. Small sample test for single mean
8. Small sample test for difference of means 9.Small sample test for correlation coefficient
10. Paired t-test(paired samples).
11. Small sample test for single variance($\chi 2$ - test )
12. Small sample test for difference of variances(F-test)
13. $\chi 2$ - test for goodness of fit and independence of attributes
14. Sign test for two samples
15. Run test for two samples
16. Median test for two independent samples

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

## Course Learning Outcomes

The students will acquire

1) Concept of law large numbers and their uses

2) Concept of central limit theorem and its uses in statistics

3) concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions,

4) knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts,

5) knowledge about inferences from Binomial, Poisson and Normal distributions as illustrations,

6) concept about non-parametric method and some important non-parametric tests.

**THREE YEAR B.A./B.Sc DEGREE EXAMINATION**
**STATISTICS(WM)**
**(W.E.F 2020-21 ADMITTED BATCH)**
**SEMESTER – III**
**PAPER 3: STATISTICAL INFERENCE**

Time: 3 Hours                                                                 Max. Marks : 75

*SECTION – A*

Answer any <u>FIVE</u> Questions :-                                          5 X 5 = 25 M

1. Define the concepts (a)Population (b)Sample (c)Paramater (d)Statistic.
2. Define (a)Convergence in Probability (b) Convergence in Distribution
3. State Neyman-factorization theorem
4. Discuss the method of Moments in estimating the parameters
5. Explain Type-I and Type-II errors..
6. Explain one tail and two tail tests
7. Explain Large sample test for sample mean.
8. Explain F test for equality of variances
9. Define Nominal and Ordinal Scales of Measurement with examples.
10. Explain two sample Sign test

*SECTION – B*

Answer any <u>FIVE</u> questions :-                                          5 X 10 = 50M

11. Define Student's t-distribution, Mention the properties
12. Define F-distribution , Mention the properties and applications
13. Discuss the properties of a Good estimator.
14. Explain MLE method of estimation and mention the properties.
15. State and Prove Neyman Pearson Lemma
16. Explain the concepts (a) Null hypothesis (b)Alternative hypothesis (c)Critical region (d)Level of significance (e)power of the test
17. Explain Large samle test for  single proportion.
    Given that on average 3% of insured people die within a year, and 75 of 1000 such persons died within a particular year. Can this group be regarded as a representative of the sample?
18. Explain (a)Paired t-test  (b) Chi-square test for goodness of fit.
19. Explain Non-parametric tests, their  advantages  and disadvantages.
20. Explain Median test for two independent samples.

**B.A/B.Sc., STATISTICS** *(WITH MATHMATICS)*
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**SEMESTER – IV**
**PAPER IV: SAMPLING TECHNIQUES AND DESIGNS OF EXPERIMENTS**

### UNIT I

**Simple Random Sampling** (with and without replacement): Notations and terminology, various probabilities of selection. Random numbers tables and its uses. Methods of selecting simple random sample, lottery method, method based on random numbers. Estimates of population total, mean and their variances and standard errors.

### UNIT II

**Stratified random sampling:** Stratified random sampling, Advantages and Disadvantages of Stratified Random sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.

**Systematic sampling:** Systematic sampling definition when N = nk and merits and demerits of systematic sampling - estimate of mean and its variance. Comparison of systematic sampling with Stratified and SRSWOR.

### UNIT III

**Analysis of variance :** Analysis of variance(ANOVA) –Definition and assumptions. One-way with equal and unequal classification, Two way classification.

**Design of Experiments:** Definition, Principles of design of experiments, CRD: Layout, advantages and disadvantage and Statistical analysis of Completely Randomized Design (C.R.D).

### UNIT IV

Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) with their layouts, Advantages, disadvantages and Analysis. Missing plot technique in RBD and LSD.

### UNIT V

**Factorial experiments** – Main effects and interaction effects of 22 and 23 factorial experiments and their Statistical analysis. Yates procedure to find factorial effect Totals.

**Text Books:**

1. Telugu Academy BA/BSc III year paper - III Statistics - Applied statistics - Telugu academy by Prof.K.Srinivasa Rao, Dr D.Giri. Dr A.Anand, Dr V.Papaiah Sastry.
2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.

**Reference Books**:

1. Fundamentals of applied statistics : VK Kapoor and SC Gupta.
2. Indian Official statistics - MR Saluja
3. AnuvarthitaSankyakaSastram - Telugu Academy.

## Practicals - Paper –IV

**Note:  Minimum of 10 practicals should be done**

### Sampling Techniques

Estimation of population mean and its variance by
1. Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR.
2. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.
3. Systematic sampling with N=nk. Comparison of systematic sampling with Stratified and
   SRSWOR.

### Design of Experiments:

4. ANOVA - one - way classification with equal and unequal number of observations
5. ANOVA Two-way classification with equal number of observations.
6. Analysis of CRD.
7. Analysis of RBD
8. Estimation of single missing observation in RBD and its analysis
9. Analysis of LSD
10. Estimation of single missing observation in LSD and its analysis
11. Analysis of $2^2$   F.E with RBD layout
12. Analysis of $2^3$ F.E  with RBD layout

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

### Course Learning Outcomes

The students shall get
1) Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
2) an idea of conducting the sample surveys and selecting appropriate sampling techniques,
3) Knowledge about comparing various sampling techniques.
4) carry out one way and two way Analysis of Variance,
5) understand the basic terms used in design of experiments,
6) use appropriate experimental designs to analyze the experimental data.

**STATISTICS(WM)**
**(W.E.F 2020-21 ADMITTED BATCH)**
**SEMESTER –IV**
**PAPER 4: SAMPLING TECHNIQUES AND DESIGN OF EXPERIMENTS**

Time: 3 Hours                                                     Max. Marks : 75

*SECTION – A*

Answer any <u>FIVE</u> Questions :-                          5 X 5 = 25 M

1.   Explain briefly Lottery method   to select a simple random sample
2.   Show that the Sample mean is UBE of the Population mean in SRSWOR.
3.   Define Proportional and  Optimum allocations  in  Stratified Random Sampling
4.   write the Merits and Demerits of Systamatic sampling.
5.   Explain one way ANOVA with equal number of observations
6.   Define CRD, Mention advantages, disadvantages of CRD
7.   Define RBD,What is the layout of RBD.
8.   Estimate the Missing Plot in LSD.
9.   What is a Factorial Experiment.
10.  What are the advantages of Factorial experiments

# SECTION - B

**Answer any FIVE Questions.**                               **5 X 10 = 50 M**

11.  In  SRSWOR show that $V(\bar{y}) = \frac{N-n}{Nn}S^2$

12.  Show that in SRSWR the sample mean square is an UBE of the Population Variance

13.  With usual notations show that     $Vopt(yst) \leq \bar{V}prop(yst) \leq V\bar{ran}(y)$

14.  If the population consists of a linear trend, show that$V(\bar{y})_{st} \leq V(\bar{y})_{sys} \leq V(\bar{y})_R$

15.  Explain the Principles of Design of Experiments
16.  Explain Two Way ANOVA
17.  Describe LSD and discuss its merits and demerits.
18.  Explain Missing Plot Technique in RBD. Also write its statistical analysis.
19.  Explain $2^2$ Factorial experiment in RBD
20.  Explain Yates procedure to find Total Effects.

## PAPER V: APPLIED STATISTICS

### UNIT I

**Time Series:** Time Series and its components with illustrations, additive, multiplicative models. Trend: Estimation of trend by free hand curve method, method of semi averages.Determination of trend by least squares (Linear trend, parabolic trend only), moving averages method.

### UNIT II

**Seasonal Component**: Determination of seasonal indices by simple averages method, ratio to moving average, Ratio to trend and Link relative methods

### UNIT III

**Growth curves:** Modified exponential curve, Logistic curve and Grompertz curve, fitting of growth curves by the method of three selected points and partial sums. Use of Growth curves.

### UNIT IV

**Index numbers:** Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and weighted index numbers. Laspayer's, Paasche's, Dorbish - Bowley and Fisher's index numbers, Criterion of a good index number, Fisher's ideal index numbers. Cost of living index number and wholesale price index number.

### UNIT V

**Vital Statistics:** Introduction, definition and uses of vital statistics, sources of vital statistics.

Measures of different Mortality and Fertility rates, Measurement of population growth. Life tables: construction and uses of life tables.(Derivations not required)

**Text Books:**

1. Fundamentals of applied statistics : VK Kapoor and SC Gupta.
2. BA/BSc III year paper - III Statistics - applied statistics - Telugu academy by prof.K.Srinivasa Rao, Dr D.Giri. Dr A.Anand, Dr V.Papaiah Sastry.

**Reference Books:**

1. AnuvarthitaSankyakaSastram - Telugu Academy.
2. Mukopadhyay, P (2011). Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
3. Brockwell, P.J. and Devis, R.A. (2003). Introduction to Time Series Analysis. Springer.
4. Chatfield, C. (2001). Time Series Forecasting., Chapman & Hall.
5. Srinivasan, K. (1998). Demographic Techniques and Applications. Sage Publications
6. Srivastava O.S. (1983). A Text Book of Demography. Vikas Publishing House

## Practical Paper –V

**Note:  Minimum of 10 practicals should be done**

**Time Series**:
1. Measurement of trend by method of moving averages(odd and even period)
2. Measurement of trend by method of Least squares(linear and parabola)
3. Determination of seasonal indices by method simple averages
4. Determination of seasonal indices by method of Ratio to moving averages
5. Determination of seasonal indices by method of Ratio to trend
6. Determination of seasonal indices by method of Link relatives

**Index Numbers:**
7. Computation of simple index numbers.
8. Computation of all weighted index numbers.
9. Computation of reversal tests.

**Vital Statistics:**
10. Computation of various Mortality rates
11. Computation of various Fertility rates 12.Computation of various Reproduction rates.
13.Construction of Life Tables

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

## Course Learning Outcomes

After completion of this course, the students will know about

1) time series data, its applications to various fields and components of time series,

2) fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic curve,

3) fitting of trend by Moving Average method,

4) measurement of Seasonal Indices by Ratio-to-Trend , Ratio-to-Moving Average and Link Relative methods,

5) Applications to real data by means of laboratory assignments.

6) Interpret and use a range of index numbers commonly used in the business sector

7) Perform calculations involving simple and weighted index numbers

8) Understand the basic structure of the consumer price index and perform calculations involving its use

9) Various data collection methods enabling to have a better insight in policy making, planning and systematic implementation,

10) Construction and implementation of life tables,

11) Population growth curves, population estimates and projections,

12) Real data implementation of various demographic concepts as outlined above through practical assignments.

**THREE YEAR B.A./B.Sc DEGREE EXAMINATION**
**STATISTICS(WM)**
**(W.E.F 2020-21 ADMITTED BATCH)**
**SEMESTER –IV**

**PAPER 5:  APPLIED STATISTICS**

Time: 3 Hours                                                                          Max. Marks : 75

SECTION – A

Answer any <u>FIVE</u> Questions :-                                           5 X 5 = 25 M

1.   Define Time Series. Mention different Models of Time Series data.
2.   Describe Linear Trend by the method of Least Squares
3.   what are Seasonal Variations
4.   Explain simple averages method to determine the Seasonal Indices
5.   Define Gompertz Curve and mention two methods to fit the curve.
6.   Explain the method of Three Selected Points to fit Modified Exponential curve
7.   Define Laspayer's, Pasche's, Fisher's Index numbers
8.   Cost of Living Index number
9.   What are the Sources of Vital Statistics
10.  What are the components of a Life Table.

SECTION – B

Answer any <u>FIVE</u>  questions                                            5 X 10 = 50 M

11.  Explain the Components of Time Series
12.  Describe the Method of Moving Averages. Also determine Trend values for the following data by taking 3 as moving period

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|------|------|------|------|------|------|------|------|
| production | 30 | 45 | 65 | 79 | 100 | 120 | 150 |

13.  Describe Link Relatives Method to determine Seasonal Indices.
14.  Explain Ratio to Trend method to find Seasonal Indices
15.  How to Fit Modified Exponential curve using Partial sums method.
16.  Explain the method of Three Selected Points to fit Logistic Curve
17.  What are the problems involved in the construction of Index Numbers
18.  what are the Properties of a Good Index Number
19.  Explain various Mortality Rates
20. Discuss various Fertility rates.

**THREE YEAR B.A./B.Sc DEGREE EXAMINATION**
**STATISTICS(WM)**
**(W.E.F 2020-21 ADMITTED BATCH)**
**STRUCTURE OF QUESTION PAPER**
**( COMMON TO ALL SEMESTERS)**

Time: 3 Hours                                                    Max. Marks : 75

SECTION – A

Answer any <u>FIVE</u> Questions :-                          5 X 5 = 25 M

1.
2.
3.
4.
5.
6.
7.
8.
9.
10

# SECTION-B

*Answer any <u>FIVE</u> questions :-*                          *5 X 10*
*= 50M*

**11.**
12.
13.
14.
15.
16.
17.
18.
19.
20.

<u>**Instruction to Paper Setter :**</u>

**Two short answer questions (5 Marks) and two essay questions (10 Marks) must be given from each unit.**