SYLLABUS

Subject: Statistics		Semester: I
Course Title: Descriptive	Statistics	
Course Code: 20STCCDS	513	
No. of Hours: 60	LTP: 400	Credits: 3
Objectives		
• To give the students	a good practice in presenta	tion and the format

- To give the students a good practice in presentation and the format most applicable to their own data.
- To provide an understanding for the graduate student on statistical concepts like measures of central tendency, dispersion and moments along with their applications.
- To provide a clear conceptual idea about Regression and correlation analysis for business / economic forecasting.
- To deal with qualitative data.

Course outcomes

- CO1: Interpret diagrammatic data presentation for common understanding
- **CO2:** Determine the reliability of an average and compare variability of two or more series and solve problems using moments.
- **CO3:** Interpret bivariate data and apply curve fitting , correlation and regression methods to forecast business data.
- **CO4:** Differentiate between quantitative and qualitative data and apply association and contingency techniques using attributes.

UNIT-I

(10 Hrs.)

Introduction to Statistics: Importance of Statistics. Scope of Statistics in different fields. Concepts of primary and secondary data. Diagrammatic and graphical representation of data: Histogram, frequency polygon, Ogives, Pie. Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean. Median and Mode through graph.

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 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), Bi-variate frequency distribution, correlation coefficient for bi-variate data and simple problems. Concept of multiple and partial correlation coefficients (three variables only) and properties

UNIT-IV

Regression: Concept of Regression, Linear Regression: Regression lines, Regression coefficients and its 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.

Skill/ Hands (12 Hrs.)

- 1. Practical case studies to know diagrammatic and Graphical presentation of data
- 2. To Apply central tendency and dispersion methods to a real life data and to draw valid conclusions from the data

(10 Hrs.)

(8 Hrs.)

(10 Hrs.)

(10 Hrs.)

- 3. Qualitative character study to check their association with each other by considering real life situations.
- 4. Hands on practice for EXCEL for Statistical applications.

Skill Based Activities .

- 1. Problem Solving
- 2. Conducting quiz
- 3. Peer group discussions
- 4. Seminars by taking real life examples

Prescribed Text Books:

- 1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
- BA/BSc I year statistics descriptive statistics, probability distribution -Telugu Academy - Dr M.Jaganmohan Rao, 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, Vol –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

Subject: StatisticsSemester: ICourse Title: Descriptive Statistical Methods - PracticalCourse Code: 20STP1DS12No. of Hours: 30LTP: 002Credits: 2

Objectives

- To give the students a good practice in presentation and the format most applicable to their own data.
- To provide hands -on experience for the graduate student on statistical concepts like measures of central tendency, dispersion and moments.
- To provide a clear practical experience about Regression & correlation analysis for business / economic forecasting as well as attributes which deal with qualitative data.

Course outcomes

- **CO1:** Interpret diagrammatic data presentation, determine the reliability of an average using central tendency measures and compare the variability of two or more series.
- CO2: Apply the curve fitting, correlation and regression methods to the given data
- **CO3:** Apply Association and Contingency techniques for qualitative data using Attributes.

LIST OF PRACTICALS

- 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, β_1 and β_2 for ungrouped data.
- 6. Computation of non-central, central moments, β_1 and β_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 for ungrouped data
- 13. Computation of Yule's coefficient of association

Subject: Statistics

Semester: II

Course Title: Probability Theory & Distributions Course Code: 20STCCPD23

No. of Hours: 60 LTP: 400 Credits: 3

Objectives

- To deal 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.
- To use various standard theoretical distributions, their chief characteristics and applications in analyzing any data.

Course outcomes

CO1: Explain the basics of probability, types, theorems and applications in real life.

- CO2: Interpret Univariate & bi-variate random variables.
- CO3: Apply mathematical expectations applications to real data.
- **CO4:** Identify different real life problems and apply discrete and

continuous distributions to draw valid inferences

UNIT-I

(10 Hrs.)

Introduction to Probability: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favorable 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 Bayes theorem and its applications in real life problems.

UNIT-II

(8 Hrs.)

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 given pmf, pdf calculation of moments, coefficient of skewness and kurtosis. Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

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. Chebyshev and Cauchy - Schwarz inequalities.

UNIT-IV

UNIT-III

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

UNIT - V

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

Skill / Hands on

- 1. Practical case studies to apply probability.
- 2. Review of articles related to the topics in the syllabus
- 3. Hands-on practice of EXCEL and SPSS for Statistical applications.

Co-curricular activities

- 1. Peer group discussions on bivariate data applications and their case studies.
- 2. Problem Solving
- 3. Conducting quiz
- 4. Seminars by taking real life examples in case of discrete distributions.
- 5. Small real life examples to apply different continuous distributions .
- 6. Preparation of videos on the subject related topics

(12 Hrs.)

(10 Hrs.)

(10 Hrs.)

(10 Hrs.)

Prescribed 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.Jaganmohan Rao, 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
- 6. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition. Pearson.

Subject: StatisticsSemester: IICourse Title: Probability Distributions - PracticalCourse Code: 20STP2PD22No. of Hours: 30LTP: 002Credits:2

Objectives

- To give practical experience on using various discrete distributions by applying them to analyze the real life data.
- To use continuous distributions for practical experience

Course outcomes

CO1: Identify different real life problems

- **CO2:** Apply discrete distributions (Binomial, Poisson, Negative Binomial and Hypergeometric) to the real life situations to draw valid conclusions.
- **CO3:** Interpret continuous distributions (Uniform, Normal and Exponential) in day to day life to draw valid inferences.

- 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.

SYLLABUS

Course Title: Elementary Statistics LTP: 200 No. of Hours: 30

Objectives

- To provide basic understating of general statistical tools and their elementary applications
- To create awareness on the Statistical System particularly in India.

Course Outcomes

CO1: Explain the scope and limitations of statistics, collection and

representation of data.

CO2: Interpret central tendency and dispersion measures to the given data.

CO3: Estimate the degree of relationship between variables using the concepts of correlation and regression.

UNIT - I

Meaning, scope and limitations of Statistics, Collection of data: Primary and Secondary, Classification and Tabulation, Construction of frequency distribution. Graphical and Diagrammatic Representation: Histogram, Ogives and Frequency polygon, Simple, Multiple Bar and Pie diagrams

UNIT-II

Measures of Central Tendency:

Features of good average, Arithmetic mean, Median, Mode. Empirical relationship between Mean, Median and Mode.

Measures of Dispersion: Range, Quartile Deviation (QD), Mean Deviation(MD), Variance, Standard Deviation(SD), relationship between QD, MD and SD. Concepts of Skewness and Kurtosis.

UNIT III

Familiarization Of the concepts relating to Correlation and Linear Regression. Their applications in the real world.

Skill /Hands on

- 1. Practical case studies to know diagrammatic and Graphical presentation of data.
- 2. To Apply central tendency and dispersion methods to a real life data and to draw valid conclusions from the data
- 3. Problem Solving
- 4. Conducting quiz

Prescribed Text Books

- 1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
- 2. Statistical Methods, S.P. Gupta, Sultan Chand and Sons, New Delhi

(5 Hrs.)

(10 Hrs.)

(7 Hrs.)

Course Code: 20LSCES2

Credits: 2

(8 Hrs.)

Subject: Statistics Semester: III Course Title: Exact Sampling Distributions & Estimation

Course Code:STATC032

No. of Hours: 60

Objectives

- Course aims to provide a clear conceptual idea about Regression and correlation analysis for business / economic forecasting.
- The concept of attributes enables students to deal with qualitative data.

Course outcomes

- CO1: Explain and interpret bivariate data
- **CO2:** Interpret the correlation and Regression between two variables.
- CO3: Determine whether the correlation is significant.
- **CO4:** Differentiate between quantitative and qualitative data and apply Association and Contingency techniques using attributes.
- **CO5:** Recall the definitions of t, F and χ^2 distributions in terms of statistics of a sample from a Normal distribution.
- **CO6:** Describe different methods of Estimation.

Unit - I

(12 Hrs.)

Mathematical expectation of bivariate random variable, covariance, additive and multiplication theorems of mathematical expectation.

Theory of Attributes (introduction, notations, dichotomy, classes and class frequencies, consistency of data, independence of attributes, association of attributes).

Unit - II

Bivariate data. Scattered Diagram. Principle of Least squares, fitting of Straight line, Quadratic, power and Exponential curves. product moment correlation coefficient and its properties, properties of regression coefficient. Spearman's rank correlation coefficient. Simple linear regression, correlation and regression - comparison, partial, Multiple correlation coefficients(only for three variables)and correlation ratio.

(14 Hrs.)

Credits: 3

Unit - III

Population, sample, parameter, statistics, standard error, sampling distributions, properties of t, F and chi-square and their relationships, Broad applications of t, F, chi-square.

Unit - IV

Point estimate of a parameter ,concept of bias and mean square error of an estimate. Criteria of good estimator-Consistency, Unbiasedness, Efficiency and sufficiency , Statement of Neyman's Factorization theorem, C. R. Rao inequality.

Unit -V

(12 Hrs.)

(12 Hrs.)

Estimation by the Method of moments and maximum likelihood method. Statements of asymptotic properties of maximum likelihood estimators. Concept of Interval estimation, Confidence intervals of parameters of Normal Population.

NOTE: The syllabus must be followed scrupulously word by word and sentence by sentence.

Recommended text book

Fundamentals of Mathematical Statistics by V. K. Kapoor and S.C. Gupta

Reference Books

- 1. Statistics-I for B.A/B.Sc first year. Published by Telugu Akademi, Andhra Pradesh.
- 2. Fundamentals of Statistics by Goon AM, Gupta M.K, Das Gupta B.
- 3. Mathematical Statistics by O.P Gupta.
- 4. Mathematical theory of probability by B.R.Bhatt.
- 5. Programmed Statistics by B.L Agarwal.

(10 Hrs.)

Subject: Statistics Course Title: Practical - III No. of Hours: 30 Semester: III Course Code:STATC033 Credits: 2

Objectives

- To provide on hands practice Regression and correlation analysis for business / economic forecasting.
- To enable students to deal with qualitative data through Attributes.

Course outcomes

CO1: Calculate the association between the given attributes.

CO2: Estimate correlation and regression to the given data

- 1. a) Simulation of random samples from Uniform (0,1), uniform (a,b) Exponential, Normal and Poisson distributions.
 - b) Simulation of random samples from uniform (0,1), uniform (a,b) Exponential, Normal and Poisson distributions.-using M.S.Excel.
 - c) Examination of independence of Attributes-Two way classified data.
- 2. a) Fitting of straight line and Parabola by method of least squares.
 - b) Fitting of straight line and Parabola by method of least squares.-using M.S.Excel.
- 3. Fitting of power curve f₀ the type Y=aX^b and Exponential curves of the type Y=ab^x Y=ae^{bx} by the method of least squares.
- 4. a) Computation of correlation coefficient, forming regression lines for grouped data.
 - b) Computation of correlation coefficient, forming regression lines for ungrouped data
- 5. Computation of multiple and partial correlation coefficients.
- 6. Computation of correlation ratio.

Subject: Statistics Course Title: Testing of Hypothesis No. of Hours: 60 Semester: IV Course Code: STATC034 Credits: 3

Objectives

- To discuss 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).
- To discuss various nonparametric tests which play an important role in many fields like pharmaceutical, agricultural, medical etc.

Course outcomes

CO1: Explain the definitions and concepts of hypothesis testing

CO2: Differentiate the types of sample sizes and different tests

CO3: Apply Large sample tests to different situations

CO4: Interpret and apply small sample tests

CO5: Distinguish between the Parametric and Non-Parametric tests

Unit - I

(12 Hrs.)

Concepts of null hypothesis, alternative hypothesis, critical region, two types of errors, level of significance and power of a test Neyman -Pearson Lemma for testing a simple null hypothesis against a simple alternative and examples in the case of Binomial, Poisson Exponential and Normal (for mean with known S.D.) distribution.

Unit – II

Large sample tests

Use of central limit theorem for testing and interval estimation of a single mean and a single proportion and difference of two means and two proportions, two standard deviations.

(14 Hrs.)

Unit - III

Tests of significance based on t (single mean, difference of means, paired test for difference of means, observed correlation coefficient), chi-square and F distributions, Chi-square test for goodness of fit, test for independence of attributes, single variance test.

Unit – IV

Nonparametric tests I :

Comparison of parametric and Non parametric tests, their advantages and disadvantages. Single sample tests: One sample Run test, Sign test and Wilcoxon Signed Rank test.

Unit –V

Nonparametric tests II

Tests for two independent samples: Median test, Wilcoxon Mann-Whitney U-test, Wald - Wolfowitz Run test(Small and Large samples)., Krushkall-Wallis test..

Recommended textbook

Fundamentals of Mathematical Statistics by V. K. Kapoor and S.C. Gupta

Reference Books

- 1. Statistics-II for B.A/B.Sc second year. Published by Telugu Akademi, Andhra Pradesh.
- 2. Fundamentals of Statistics by Goon AM, Gupta M.K, Das Gupta B.
- 3. Mathematical Statistics by O.P Gupta.
- 4. Programmed Statistics by B.L Agarwal.

(12 Hrs.)

(10 Hrs.)

(12 Hrs.)

Subject: Statistic Course Title: Practical - IV No. of Hours: 30 Semester: IV Course Code:STATC035 Credits: 2

Objectives

- To Test the Hypothesis and apply various large sample tests (Z-test), small sample tests (t-test, F-test, chi-square test) to the given data.
- To apply various non parametric tests to problems from pharmaceutical, agricultural, medical fields etc.

Course outcomes

CO1: Apply Small sample tests to different situations of lifeCO2: Give inferences for different situations using inferential statisticsCO3: Apply the non-parametric tests

- 1. Tests for proportion(large samples).
- 2. Tests for means and variances and standard deviations(large sample).
- 3. a) Test for means and correlation (single mean, difference of means, paired t, observed correlation coefficient).
 - b) Test for means and correlation (single mean, difference of means, paired t, observed correlation coefficient).-using M.S.Excel.
- 4. a) Test for variances(single variance-Chi square and difference of variances-F).
 - b) Test for variances(single variance-Chi square and difference of variances-F). using M.S.Excel.

Subject: Statistics

Semester: V

Course Title: Sample Surveys and Analysis of Variance

Course Code: STATC036 Credits: 3

No. of Hours: 45

Objectives

- To design and conduct the sample surveys by using different sampling techniques and to draw conclusions.
- To study the variance types and effects on the given data and to analyze it.

Course outcomes

- **CO1:** Design and implement surveys with the sampling designs (simple random, systematic, stratified).
- **CO2:** Estimate sample size for different sampling designs in order to estimate population level point estimates and testing null hypothesis
- **CO3:** Estimate design weights and adjust for non-response.
- **CO4:** Interpret the functions of NSSO, CSO and RBI and assess the importance of Statistical surveys in obtaining the data which in turn helps in drawing valid conclusions about the social, economical data of the country.
- **CO5:** Compute and interpret the results of ANOVA and F-test.

UNIT – I

(10 Hrs.)

Sample surveys, Concepts of population and sample, need for sampling, Census and sample survey, basic concepts in sampling, organizational aspects of survey sampling, sample selection and sample size

Some basic sampling methods – simple random sampling (SRS) with and without replacement.

UNIT – II

(10 Hrs.)

Stratified random sampling , Systematic sampling, ratio and regression methods of estimation under SRS.

(9 Hrs.)

(10 Hrs.)

Non-sampling errors, acquaintance with the working (questionnaires, sampling design, methods followed in field investigation, principal findings etc.) of NSSO and RBI undertaking sample surveys. Functions of CSO.

UNIT – IV

Analysis of variance for one-way and two-way classifications, clearly stating the assumptions.

(6 Hrs.)

Analysis of covariance- it's objectives-types.

Recommended textbook

1. V. K. Kapoor and S.C. Gupta: Fundamentals of Applied Statistics, S Chand Publ.

Reference Books

- 1. Sampling Theory of surveys with applications by P. V. Sukhatme & B. V. Sukhatme:
- 2. Sampling theory and Methods by Murthy M.N.
- 3. Applied Statistics for B.A/B.Sc Third year. Published by Telugu Akademi ,Andhra Pradesh
- 4. Programmed Statistics by BL Agarwal.

UNIT – III

UNIT – V

Subject: Statistics

Semester: V

Course Title: Statistical Quality Control and Reliability

Course Code:STATC037 Credits: 3

No. of Hours: 45

Objectives

- To construct control charts for different variables and attributes and to check whether the given data's quality is under control.
- To test the reliability of given objectives.

Course outcomes

- **CO1:** Differentiate the concepts of Quality Control(SQC) and Statistical Process Control (SPC)
- **CO2:** Construct different control charts for variables(x-bar, R charts) and attributes(p,np and c charts)
- **CO3:** Identify different acceptance sampling plans and differentiate them.
- CO4: Distinguish between quality and reliability
- CO5: Describe reliability methods

UNIT – I

(9 Hrs.)

Importance of statistical methods in industrial research and practice, specification of items and lot qualities corresponding to visual gauging, count and measurements, types of inspection, determinations of tolerance limits. General theory of control charts, causes of variations in quality, control limits, sub-grouping, summary of out-of-control criteria.

UNIT – II

Charts for attributes np chart, p-chart, c-chart, u-chart, Chart for variables – X-bar and R charts, design of X-bar and R charts versus p-charts, process capability studies.

(10 Hrs.)

UNIT – III

Principle of acceptance sampling – problem of lot acceptance, stipulation of good and bad lots, producers and consumer's risks, single sampling plan, their OC functions, Concepts of AQL LTPD, AOQL, average amount of inspection and ASN function.

UNIT – IV

Reliability: Introduction, Hazard function, Exponential distribution as life model, its memory – less property. Reliability function and its estimation.

UNIT-V

Concepts of censoring and truncation. System reliability-series, parallel and K out of n systems and their reliability.

Recommended textbook

1. V. K. Kapoor and S.C. Gupta: Fundamentals of Applied Statistics S. Chand Publ.

Reference Books

- 1. Bowden, D.J.: Statistical Methods in Quality control. by Bowden, D.J.
- 2. Duncan, A. J.: Quality control and Industrial statistics by Duncan, A. J.
- 3. Grant E.L.: Statistical Quality control by Grant E.L.
- 4. Applied Statistics for B.A/B.Sc Third year. Published by Telugu Akademi ,AP
- 5. Programmed Statistics by BL Agarwal.

(10 Hrs.)

(8 Hrs.)

(8 Hrs.)

Subject: Statistics Course Title: Practical - V No. of Hours: 30 Semester: V Course Code:STATC038 Credits: 2

Objectives

- To design and conduct the sample surveys by using different sampling techniques and to draw conclusions.
- To study the variance types and effects on the given data and to analyze it.

Course outcomes

CO1: Able Prepare the questionnaires

CO2: Able to conduct the surveys by applying different sampling techniques

CO3: Able to Draw inferences about the ANOVA techniques

- 1. Simple Random Sampling : calculation of Variances , Comparison of SRSWOR and SRSWR
- 2. Stratified Random Sampling: Allocation of sample sizes(Proportional and Optimum allocation)
- 3. Analysis of one way classified data
- 4. Analysis of two way classified data
- 5. Analysis of covariance

Subject: Statistics Course Title: Practical - VI No. of Hours: 30 Semester: V Course Code:STATC039 Credits: 2

Objectives

- To construct control charts for different variables and attributes and to check whether the given data's quality is under control.
- To test the reliability of given objectives.

Course outcomes

CO1: Draw the control charts

CO2: Calculate the risk of probability insurance sector

CO3: To calculate the Reliability methods

- 1. Control charts for x-bar and R charts
- 2. Control charts for fraction of defectives
- 3. Control charts for number of defectives
- 4. Control charts for x-bar charts
- 5. Calculation of Reliability constants

Subject: Statistics Course Title: Time Series Analysis No. of Hours: 45 Semester: VI Course Code: STATC040 Credits: 3

Objectives

- To analyze the given time series data and to estimate the trend, seasonality and cyclic effects on it.
- To incorporate the skills to forecast economic variables by studying AR, ARIMA & ARMA models.

Course outcomes

CO1: Interpret the Chronological data and its importance in Economy

- CO2: Apply Trend derivation methods
- CO3: Analyze the Growth curves
- CO4: Establish relation between cause and effects Cyclic Variations.
- **CO5:** Acquire the skills to forecast about the economic variables.
- **CO6:** Discuss the concepts of white Noise, Auto Regression, Autocorrelation, Stationarity, ARMA and ARIMA

UNIT I

(8 Hrs.)

Introduction to times series data, application of time series from various fields, Components of a times series, Decomposition of time series. Trend: Estimation of trend by free hand curve method, method of semi averages, Method of moving averages, Detrending. Effect of elimination of trend on other time series. components of fitting a various mathematical curve, and growth curves.

UNIT II

Seasonal Component: Estimation of seasonal component by Method of simple averages, Ratio to Trend, Ratio to Moving Averages and Link Relative method, Deseasonalization.

(10 Hrs.)

(10 Hrs.)

(10 Hrs.)

UNIT III

Cyclic Component: Harmonic Analysis. Some Special Processes: Moving-average (MA) process and Autoregressive (AR) process of orders one and two, Estimation of the parameters of AR (1) and AR (2) – Yule-Walker equations.

UNIT IV

Random Component: Variate component method. Forecasting: Exponential smoothing methods, Short term forecasting methods: Brown's discounted regression, Box-Jenkins method and Bayesian forecasting.

UNIT V

(7 Hrs.)

Stationary Time series: Weak stationarity, autocorrelation function and correlogram of moving average.

Prescribed Textbook

1. SC Gupta & VK Kapoor : Fundamentals of Applied Statistics

Suggested Readings

- 1. Kendall M.G. (1976): Time Series, Charles Griffin.
- 2. Chatfield C. (1980): The Analysis of Time Series An Introduction, Chapman & Hall.
- 3. Mukhopadhyay P. (2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied

Subject: Statistics

Course Title: Operations Research

No. of Hours: 45

Semester: VI Course Code:STATC041 Credits: 3

Course Objectives

- The objective of this paper is to give the students a good understanding of OR
- The objective of this course is to provide a practice of basic simplex methods and its applications to the real world.

Course Outcomes

CO1: Understand the scope of Operations Research using additional OE resources available in the internet using modern ICT tools.CO2: Knowledgeable about the Linear programming problem

CO3: Able to solve LPP

CO4: Analyze the Two-phase simplex method

UNIT-1

(8 Hours)

Origin and development of O.R, nature and features of O.R, Modeling in O.R, General solution methods for O.R models, Scientific & Methodology of O.R, Applications of O.R, Opportunities and Shortcomings of O.R.

UNIT -II

(10 Hours)

Linear programming problem:

Introduction, Mathematical formulation of the problem, Introduction to Graphical method, General linear Programming problem, Cononical and standard forms of L.P.P.

UNIT-III

(10Hours)

Simplex Method:

Introduction, Fundamental properties of Solutions, The computational procedure, Use of Artificial variables, solutions of simultaneous Linear equations, Applications of simplex method.

UNIT-IV

(10 Hours)

Duality in Linear programming:

Introduction, General Primal-Dual pair, Formulating a Dual Problem, Primal-Dual pair in matrix form, Duality theorems.

UNIT-V

(7 Hours)

Complementary slackness theorem, Duality and simplex method, Economic interpretation of Duality, Dual simplex method, Revised simplex method.

Recommended text book

1.Operations Research by...Kanthi Swaroop, P.K. Gupta and Man Mohan2.Operations Research by V. K. Kapoor.

Reference Books

1.S.K sinha:Reliability and life testing.wiley Eastern

- 2. Parimal Mukhopadhyay: Applied Statistics, New central book agency
- 3. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.

Subject: Statistics Course Title: Designs of Experiments No. of Hours: 45 Semester: VI Course Code:STATC042 Credits: 3

Objectives

- To understand the principles of designs and layout them
- To analyze the designs by applying them to real world situations and to get valid conclusions.

Course outcomes

CO1: Summarize the principles, phases, and scope of Designs
CO2: Interpret the analysis of Basic designs (CRD, RBD and LSD)
CO3: Explain Balanced and Partially balanced Incomplete Block Designs
CO4: Demonstrate how to analyze the results of the full Factorial designs.
CO5: Explain the concept of Fractional Factorial Designs.

UNIT I

(12 Hrs.)

Experimental designs: Role, historical perspective, terminology, experimental error, basic principles, uniformity trials, fertility contour maps, choice of size and shape of plots and blocks. Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD)

UNIT II

(12 Hrs.)

Latin Square Design (LSD) – layout, model and statistical analysis, relative efficiency, analysis.Missing observations derivation in RBD,LSD.

UNIT III

Incomplete Block Designs: Balanced Incomplete Block Design (BIBD) – parameters, relationships among its parameters, incidence matrix and its properties, Symmetric BIBD, Resolvable BIBD, Affine Resolvable BIBD, Intra Block analysis, complimentary BIBD, Residual BIBD, Dual BIBD, Derived BIBD.

(7 Hrs.)

UNIT IV

(9 Hrs.)

Factorial experiments: advantages, notations and concepts, 2^2 , $2^3...2^n$ and 3^2 factorial experiments, design and analysis, Total and Partial confounding for 2^n (n≤5), 3^2 and 3^3 . Factorial experiments in a single replicate.

UNIT V

(5 Hrs.)

Fractional factorial experiments: Construction of one-half and one-quarter fractions of 2^n (n≤5) factorial experiments, Alias structure, Resolution of a design.

Prescribed Textbook

SC Gupta, VK Kapoor: Fundamentals of Applied Statistics.
 S. Chand Publications

Suggested Readings

- 1. Cochran, W.G. and Cox, G.M. (1959): Experimental Design. Asia Publishing House.
- 2. Das, M.N. and Giri, N.C. (1986): Design and Analysis of Experiments. Wiley EasternLtd.
- Goon, II, 8thEdn. A.M., World Gupta, Press, M.K. Kolkata.and Dasgupta, B. (2005): Fundamentals of Statistics. Vol.II
- 4. Kempthorne, O. (1965): The Design and Analysis of Experiments. John Wiley.
- 5. Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.

Subject: Statistics Course Title: Demography and Vital Statistics No. of Hours: 45 Semester: VI Course Code:STATC043 Credits: 3

Objectives

- To understand the theories and types of population and to calculate birth and death rates of the country.
- To construct the life tables and to get the life expectancy which in turn is used in deciding the premiums of the life insurance policies.

Course outcomes

CO1: Understand the basic concepts of population theories and find the errors.

- **CO2:** Interpret birth and death rates.
- **CO3:** Calculate life span of a person.
- **CO4:** Predict the population projections.

UNIT- I

(8 Hrs.)

Population Theories: Coverage and content errors in demographic data, use of balancing equations and Chandrasekharan-Deming formula to check completeness of registration data. Adjustment of age data, use of Myer and UN indices, Population composition, dependency ratio.

UNIT- II

(9 Hrs.)

Introduction and sources of collecting data on vital statistics, errors in census and registration data. Measurement of population, rate and ratio of vital events. Measurements of Mortality: Crude Death Rate (CDR), Specific Death Rate (SDR), Infant Mortality, Rate (IMR) and Standardized Death Rates.

of Life Tables. Abridged Life Tables; Concept and construction of abridged life

tables by Reed-Merrell method, Greville's method and King's Method

UNIT IV

UNIT III

Measurements of Fertility: Crude Birth Rate (CBR), General Fertility Rate (GFR), Specific Fertility Rate (SFR) and Total Fertility Rate (TFR).

Stationary and Stable population, Central Mortality Rates and Force of Mortality.

Life(Mortality) Tables: Assumption, description, construction of Life Tables and Uses

UNIT-V

(10 Hrs.)

(8 Hrs.)

Measurement of Population Growth: Crude rates of natural increase, Pearl's Vital Index, Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR).

Prescribed Text book

SC Gupta & VK Kapoor: Fundamentals of Applied Statistics. S. Chand Publ.

Suggested Reading

- 1. Mukhopadhyay P. (1999): Applied Statistics, Books and Allied (P) Ltd.
- 2. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9th Edition, World Press.
- 3. Biswas, S. (1988): Stochastic Processes in Demography & Application, Wiley EasternLtd.
- 4. Croxton, Fredrick E., Cowden, Dudley J. and Klein, S. (1973): Applied General Statistics, 3rd Edition. Prentice Hall of India Pvt. Ltd.
- 5. Keyfitz N., Beckman John A.: Demography through Problems S-Verlag New york.

(10 Hrs.)

Course Title: Operations Research-I

No. of Hours: 45

Subject: Statistics

Course Objectives

Semester: VI Course Code:STATC045 Credits: 3

- The objective of this course is to give practical knowledge about Transportation and assignment problems.
- This course objective is to process the jobs on different machines.

Course Outcomes

CO1: Understand the special types of LPP **CO2**:Formulation of models to different problems

- **CO3**: Explain the best utilization of limited resources to get optimum results using additional OE resources available in the internet using modern ICT tools.
- CO4: Describe replacement, recruitment problems

UNIT-I

TRANSPORTATION PROBLEM

Transportation Problem- Introduction, Linear programming formulation, Matrix form of transportation problem, Finding an initial basic feasible solution (IBFS) by North West Corner Rule, Lowest cost entry method, Vogel's approximation method, Unbalanced transportation problem, Optimal solution using MODI method and stepping stone algorithm.

UNIT-II

ASSIGNMENT PROBLEM

Assignment Problem- introduction, LP formulation of assignment problem, Hungarian method of assignment problem, unbalanced assignment problem, Travelling- Salesman problem.

UNIT - III SEQUENCING PROBLEM

Sequencing Problem- Introduction, Principal Assumptions, Processing n Jobs Through two machines, processing n Jobs Through three machines, n jobs through k machines.

(10 Hours)

(8 Hours)

(10 Hours)

UNIT-IV REPLACEMENT PROBLEM

(10 Hours)

Introduction, Replacement of equipment/Asset that Deteriorates Gradually, Replacement of Equipment that Fails suddenly.

UNIT-V

(7 Hours)

Recruitment and Promotion problem, Equipment Renewal problem, Reliability and system failure rates.

Recommended text book

1.Operations Research by...Kanthi Swaroop, P.K. Gupta and Man Mohan2.Operations Research by V. K. Kapoor.

Reference Books

1.S.K sinha:Reliability and life testing.wiley Eastern

2. Parimal Mukhopadhyay: Applied Statistics, New central book agency

3. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.

Subject: Statistics

Course Title: Operations Research-II No. of Hours: 45

Semester: VI Course Code:STATC046 Credits: 3

Course Objectives

- The objective of this course is to give knowledge about Game theory
- This course objective is to process the mXn game by LPP, EOQ problems and inventory problems.

Course Outcomes

CO1: Understand Game theory

- CO2: Understand Inventory control decisions
- **CO3**: Solve deterministic costs inventories using additional OE resources available in the internet using modern ICT tools.
- CO4: Analyze the probabilistic Inventory models

UNIT-I

GAME THEORY:

Introduction, Two-person zero sum games, Some basic terms, The Maximin-Minimax Principle, Games without saddle point—Mixed Strategies.

UNIT-II

Dominance property, Arithmetic method for n x n games, General solution of m x n rectangular games, Game against Passivity, limitations and extensions.

UNIT-III

INVENTORY CONTROL:

Introduction, the inventory decisions, Costs associated with Inventories, Economic order Quantity.

UNIT-IV

Deterministic Inventory problems with No Shortages, Deterministic Inventory with Shortages, EOQ problems with price breaks.

(10 Hours)

(10 Hours)

(8 Hours)

(10 Hours)

UNIT-V

(7Hours)

Multi-item Deterministic problems, Inventory problems with Uncertain demand, System of inventory control, Probabilistic Inventory problems.

Recommended text book

1.Operations Research by...Kanthi Swaroop, P.K. Gupta and Man Mohan2.Operations Research by V. K. Kapoor.

Reference Books

1.S.K sinha:Reliability and life testing.wiley Eastern

- 2. Parimal Mukhopadhyay: Applied Statistics, New central book agency
- 3. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.

Subject: Statistics Course Title: Practical - VII No. of Hours: 30 Semester: VI Course Code:STATC048 Credits: 2

Objectives

- To analyze the given time series data and to estimate the trend, seasonality and cyclic effects on it.
- To incorporate the skills to forecast economic variables by studying AR, ARIMA & ARMA models.

Course outcomes

CO1: Interpret the Chronological data and its importance in Economy

- CO2: Apply Trend derivation methods
- CO3: Establish relation between cause and effects Cyclic Variations.
- **CO4:** Acquire the skills to forecast about economic variables.

- 1. Fitting and plotting of modified exponential curve
- 2. Fitting and plotting of Gompertz curve
- 3. Fitting and plotting of logistic curve
- 4. Fitting of trend by Moving Average Method
- 5. Measurement of Seasonal indices Ratio-to-Trend method
- 6. Measurement of Seasonal indices Ratio-to-Moving Average method
- 7. Measurement of seasonal indices Link Relative method
- 9. Forecasting by exponential smoothing
- 10. Forecasting by short term forecasting methods.

Subject: Statistics Course Title: Practical - VII Cours No. of Hours: 30

Semester: VI Course Code:STATC049

Credits: 2

Objectives

- The objective of this paper is to give the students a good understanding of OR
- The objective of this course is to provide a practice of basic simplex methods and its applications to the real world.

Course Outcomes

- CO1: Able to solve LPP
- CO2: Analyze the Two-phase simplex method

- 1. Formulation of Linear programming problems
- 2. Formulation and graphical solution of Linear programming problems
- 3. Simplex method of solving an LP Problem
- 4. Solving an LPP using Big-M method.
- 5. Solving an LPP using the Two Phase method.
- 6. Solving an LPP using dual simplex method

Subject: Statistics Course Title: Practical - VIII No. of Hours: 30 Semester: VI Course Code: STATC050 Credits: 2

Objectives

- To layout the designs
- To analyze the designs by applying them to real world situations and to get valid conclusions.

Course outcomes

CO1: Interpret the analysis of Basic designs (CRD,RBD and LSD)CO2: Demonstrate how to analyze the results of the full Factorial designs.

- 1. Analysis of a CRD
- 2. Analysis of an RBD
- 3. Analysis of an LSD
- 4. Analysis of an RBD with one missing observation
- 5. Analysis of an LSD with one missing observation
- 6. Intra Block analysis of a BIBD
- 7. Analysis of 2² and 2³ factorial in CRD and RBD
- 8. Analysis of 2² and 2³ factorial in LSD
- 9. Analysis of a completely confounded two level factorial design in 2 blocks
- 10. Analysis of a completely confounded two level factorial design in 4 blocks
- 11. Analysis of a partially confounded two level factorial design
- 12. Analysis of a single replicate of a 2ⁿ design
- 13. Analysis of a fraction of 2ⁿ factorial design

Subject: Statistics Course Title: Practical - IX No. of Hours: 30 Semester: VI Course Code: STATC051 Credits: 2

Objectives

- To calculate the birth and death rates of the country.
- To construct the life tables and to get the life expectancy which in turn is used in deciding the premiums of the life insurance policies.

Course outcomes

CO1: Interpret birth and death rates.

CO2: Calculate the life span of a person.

CO3: Predict the population projections

- 1. To calculate CDR and Age-Specific death rate for a given set of data
- 2. To find Standardized death rate by (i) Direct method (ii) Indirect method
- 3. To construct a complete life table
- 4. To fill in the missing entries in a life table
- 5. To calculate probabilities of death at pivotal ages and use to construct abridged Life table using (i) Reed-Merrell Method, (ii) Greville's Method, and (iii) King's Method
- 6. To calculate CBR, GFR, SFR, TFR for a given set of data
- 7. To calculate the Crude rate of Natural Increase and Pearle's Vital Index for a given set of data
- 8. Calculate GRR and NRR for a given set of data and compare them

Subject: Statistics

Course Title: Practical - VIII No. of Hours: 30 Semester: VI

Course Code:STATC053 Credits: 2

Objectives

- The objective of this course is to give practical knowledge about Transportation and assignment problems.
- This course objective is to process the jobs on different machines.

Course Outcomes

- CO1: Formulation of models to different problems
- CO2: Describe replacement, recruitment problems

- 1. Formulation and simple solution of Transportation problem
- 2. Formulation and simple solution of Assignment problem
- 3. Formulation and simple solution of Traveling salesman's problem
- 4. Hungarian Method of Assignment problem.
- 5. Processing 'n' jobs through 2 machines.
- 6. Processing 'n' jobs through 3 machines.
- 7. Solving Replacement problems.

Subject: Statistics

Course Title: Practical - IX No. of Hours: 30 Semester: VI

Course Code:STATC054 Credits: 2

Objectives

- The objective of this course is to give practical knowledge about Game theory
- This course objective is to process the mXn game by LPP, EOQ problems and inventory problems.

Course Outcomes

CO1: Solving a two person zero sum game by using different properties

CO2: Solving Inventory and EOQ problems.

- 1. Solving a two person zero sum game using Minimax- Maximin criterion.
- 2. Solving a two person zero sum game with and without saddle points.
- 3. Solving a two person zero sum game using dominance property.
- 4. Solution of mxn game by LPP.
- 5. Solving inventory problems with and without shortages.
- 6. Solving EOQ problems with price breaks.
- 7. Solving inventory problems with uncertain demand.
- 8. Solving Probabilistic inventory problems.

Subject: Statistics

Course Title: Major Project No. of Hours: 45 Semester: VI Course Code:STATC056 Credits: 3

Objectives

- To give a practical exposure to the students towards the applications of statistical techniques in the real world.
- To make them familiar with the use of SPSS

Course outcomes

- **CO1:** Prepare the questionnaire to fit the objective of the project.
- **CO2:** Collect data and apply statistical techniques
- CO3: Analysis and interpretation of the project.
- CO4: Draw inferences about the data collected.

Guidelines

- 1. All students must carry out an independent study in an area of their interest.
- 2. The project should be new, original and not a replica of existing work
- 3. The project report should be submitted at the 6th SEE
- 4. The student should work under the guidance of a project guide
- 5. The student should submit a hard copy of the project report and a soft copy of the same to the guide.
- 6. The group project includes the names of 3 to 5 students to be mentioned on the title page and certificate page.
- 7. In case of a student's project being not approved, she is not eligible to get
 - a final degree certificate. The student then has to rewrite the project based on the remarks of the evaluator.

Structure of the Project Report

- I. Preliminary pages:
 - 1. Title page
 - 2. Certificate page
 - 3. Declaration
 - 4. Table of contents
 - 5. Abstract of the project
- II. Main Document:

Chapter 1: Introduction, Abstract of the project Chapter 2: Statistical Techniques Chapter 3: Statistical Analysis of data Chapter 4: Conclusions and Limitations of study Chapter 5: References (Bibliography)

Evaluation criteria

- 1. Evaluation has to be done by the internal examiner & project supervisor
- 2. Maximum marks: 100

(Project Report: 40M, Project Execution: 50M, Viva: 10M)

3. Minimum pass marks: 40M

Subject: Statistics Course Title: Major Project No. of Hours: 45 Semester: VI Course Code:STATC057 Credits: 3

Objectives

- To give a practical exposure to the students towards the applications of statistical techniques in the real world.
- To make them familiar with the use of SPSS

Course outcomes

- **CO1:** Prepare the questionnaire to fit the objective of the project.
- **CO2:** Collect data and apply statistical techniques
- CO3: Analysis and interpretation of the project.
- **CO4:** Draw inferences about the data collected.

Guidelines

- 1. All students must carry out an independent study in an area of their interest.
- 2. The project should be new, original and not a replica of existing work
- 3. The project report should be submitted at the 6th SEE
- 4. The student should work under the guidance of a project guide
- 5. The student should submit a hard copy of the project report and a soft copy of the same to the guide.
- 6. The group project includes the names of 3 to 5 students to be mentioned on the title page and certificate page.
- 7. In case of a student's project being not approved, she is not eligible to get
 - a final degree certificate. The student then has to rewrite the project based on the remarks of the evaluator.

Structure of the Project Report

- I. Preliminary pages:
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 - Chapter 1: Introduction, Abstract of the project
 - Chapter 2: Statistical Techniques
 - Chapter 3: Statistical Analysis of data
 - Chapter 4: Conclusions and Limitations of study
 - Chapter 5: References (Bibliography)

Evaluation criteria

- 1. Evaluation has to be done by the internal examiner & project supervisor
- 2. Maximum marks: 100

(Project Report: 40M, Project Execution: 50M, Viva: 10M)

3. Minimum pass marks: 40M

Subject: Statistics

Course Title: Practical - X

No. of Hours: 30

Semester: VI Course Code:STATC058 Credits: 2

Objectives

- To give a practical exposure to the students towards the applications of statistical techniques in the real world by using SPSS.
- To make them familiar with the use of SPSS

Course Outcomes

CO 1: To analyze given data by applying different Statistical techniques using SPSS software.

CO 2: Draw inferences about the data collected

- 1. Questionnaire coding-Data cleaning
- 2. Frequency table, Cross tabs, Establishing ratio into interval scale and converting string into variable form.
- 3. Data merge, sorting, Transpose and File export.
- 4. Transformation of variables.
- 5. Bi -variate and partial correlation.
- 6. Regression.
- 7. t- test for one sample.
- 8. t-test for independent samples.
- 9. Paired t-test.
- 10. Z- test for single mean.
- 11. Z- test for two means.
- 12. Z- test for two standard deviations.
- 13. Z- test for single proportion.
- 14. Z- test for two proportions.
- 15. Chi-square test.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA - 8

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SYLLABUS

Subject: Statistics

Course Title: Practical - X

Semester: VI

Course Code:STATC059

No. of Hours: 30

Credits: 2

Objectives

- To give a practical exposure to the students towards the applications of statistical techniques in the real world by using SPSS.
- To make them familiar with the use of SPSS

Course Outcomes

CO 1: To analyze given data by applying different Statistical techniques using SPSS software.

CO 2: Draw inferences about the data collected

- 1. Questionnaire coding-Data cleaning
- 2. Frequency table, Cross tabs, Establishing ratio into interval scale and converting string into variable form.
- 3. Data merge, sorting, Transpose and File export.
- 4. Transformation of variables.
- 5. Bi -variate and partial correlation.
- 6. Regression.
- 7. One way ANOVA.
- 8. Two way ANOVA.
- 9. Construction of x and R charts.
- 10. Construction of p- chart.
- 11. Construction of Np- Chart.
- 12. Construction of C- chart.
- 13. Construction of U-chart.
- 14. Construction of Trend line.