ANDHRA LOYOLA COLLEGE (Autonomous)

VIJAYAWADA 520008

ODD Semester Syllabus

Board of Studies Meeting on 15-06-2022

B.A./B.Sc.,

STATISTICS SYLLABUS

(With Mathematics Combination)

CHOICE **B**ASED **C**REDIT **S**YSTEM **(CBCS)** REVISED SYLLABUS

With effect from the academic year 2021-22

DEPARTMENT OF STATISTICS - COURSE STRUCTURE Semesters I, III &V (REVISED CBCS)					
B.Sc. - Maths, Stat, Comp Sc: Maths,Phy,Stat: B.A. - Maths,Economics, Stat:					
Year	**Semester**	**Course**	**Title of the Course**	**No. of Hrs/W**	**No.of Credits**
1	**I**	**1**	Descriptive Statistics and Theory of Probability	**4**	**3**
			Practical Course – I	**2**	**2**
		LSC	Elementary Statistics	**2**	**2**
2	**III**	**3**	Statistical Methods and Exact Sampling Distributions	**4**	**3**
			Practical Course – III	**2**	**2**
		5	Applied Statistics	**4**	**3**
			Practical Course – V	**2**	**2**
3	**V**	**6 and 7**	6 A Operations Research 7 ABasic Statistical Data Analysis Using R 6 B Operations Research I 7 B Operations Research II **(or)** 6 C Statistical Process and Quality Control 7 C Computational Techniques & R Programming **(or)** 6 D Econometrics 7 D Regression Analysis	**3** **3**	**3** **3**
			Practical Course – VI	**3**	**2**
			Practical Course – VII	**3**	**2**
Certificate Course/s			(i) Introduction to Bio Statistics (ii) Statistics for Merchants	**3**	**2**

DEPARTMENT OF STATISTICS - COURSE STRUCTURE Semesters I, III & V(REVISED CBCS)					
B.SC - Maths, Big Data Analytics, Statistics: Maths, Artificial Intelligence, Statistics					
Year	**Semester**	**Course**	**Title of the Course**	**No. of Hrs/W**	**No.of Credits**
1	**I**	**1**	Statistical Methods	**4**	**3**
			Practical Course - I	**2**	**2**
2	**III**	**3**	Probability Distributions	**4**	**3**
			Practical Course - III	**2**	**2**
3	**V**	**5**	Applied Statistics	**4**	**3**
			Practical Course - V	**2**	**2**

Year of Revision:2021-22(Revised CBCS- APSCHE)Percentage of Revision:NIL

ANDHRA LOYOLA COLLEGE (AUTONOMOUS)
VIJAYAWADA
DEPARTMENT OF STATISTICS

I B.A./B.Sc. – SEMESTER I **Course Code: STA-111-DSP**

Course Title: DESCRIPTIVE STATISTICS AND THEORY OF PROBABILITY

Total Hrs./Semester: 60 **Hrs./W: 4+2** **Max. Marks:100**

Course Prerequisites: Students required basic knowledge in Calculus, Algebra and Probability.

Course Description: This course helps the students to organize and present the data in visual form and identifying the basic characteristics of the statistical data. Providing basic knowledge in probability and its laws.

Course Objectives

CO 1	Organize, manage and present data and to analyze statistical data graphically using frequency distributions and cumulative frequency distributions.
CO 2	Analyze statistical data using measures of central tendency, dispersion and location and to use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events
CO 3	Translate real-world problems into probability models and to derive the probability density function of transformation of random variables.
CO 4	Calculate probabilities and derive the marginal and conditional distributions of bi-variate random variables and to analyze Statistical data.
CO 5	Expectation of random variable and its properties and various function of random variable.

Expected Learning Outcomes: At the end of the course, the student will

1)Acumen to organize and present the data in a visual form.

2)Able to identify the basic characteristics of the statistical data.

3)Able to differentiate the deterministic and probabilistic situations. Basic rules and concepts of probability.

UNIT – I **(12hrs)**

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation.

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 **(8hrs)**

Principle of least squares, fitting of: straight line (y= ax+b), quadratic ($y=ax^2+bx+c$), power curve ($y=ax^b$) and exponential curves ($y=ab^x$, $y=ae^{bx}$)

UNIT – III **(16hrs)**

Introduction to Probability: Definition of probability, various approaches of probability – Random Experiment, Trial, sample point, event and sample space, power set, operations of events, mutually exclusive and exhaustive events. Discrete and Continuous sample space, properties of probability based on axiomatic approach, Boole's inequalities, addition theorem and multiplication theorem of probability conditional probability, independence of events, Bayes' theorem and its applications.

UNIT – IV **(12hrs)**

Random Variables: Definition of discrete random variables, probability mass function, idea of continuous random variable, probability density function, illustrations of random variables and its properties, transformation of one dimensional random variable.

UNIT – V **(12hrs)**

Expectation of a random variable and its properties, addition and multiplication theorems – raw moments and central moments, measures of location, dispersion, skewness and kurtosis,

Cauchy Schwartz inequality, probability generating function (if it exists), Moment generating function (mgf), Characteristic function (cf) cumulate generating function (cgf), their properties and uses.

BOOKS FOR STUDY:

1. Mathematical statistics John E Freund, Ronald E Walpole PHI publications
2. Fundamentals of Mathematical Statistics, VK Kapoor, SC Gupta, Sultan Chand, New Delhi.
3. Statistics first year Telugu academy

BOOKS FOR REFERENCE:

1. Probability and Statistics in Engineering- Hines,Montogomery et al John Wiley sons
2. Fundamentals of statistics, Goon AM, Gupta MK, das Gupta B, World Press, Calcutta.
3. New Mathematical Statistics, Sanjay Aurora and Bansilal.
4. Statistics: A Beginner's Text Vol. I, Bhat BR, Srivenkataramana T and Rao Madhava KS, New age international (P) Ltd.
5. Introduction to the theory of Statistics, Mood AM, Graybill FA and Bose DC, McGraw Hill.
6. Introduction to Mathematical Statistics Robert V Hogg, Allen T Craig, Pearson Education

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

List of Practical's

On successful completion of the course, students will be able to

- ***Identify the basic characteristics to the givendata.***
- ***Fit mathematical models to the given data***

1. Measures of central tendency
2. Measures of dispersion
3. Moments
4. Fitting of straight line
5. Fitting of second-degree parabola
6. Fitting of exponential curve of the form $y = ae^{bx}$
7. Fitting of exponential curve of the form $y = ab^{x}$
8. Fitting of power curve of the form $y = ax^{b}$

Co-Curricular Activities in the class:

1. Interactive Sessions
2. Concepts relates to the day to day events/ real world examples

Year of Introduction: 2019-20 **Percentage of Revision: NIL**

(For Big Data Analysis and Artificial Intelligence)

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

DEPARTMENT OF STATISTICS

I B.Sc. – SEMESTER I **Course Code: STA-111-SM**

Course Title: STATISTICAL METHODS

Total Hrs./Semester: 60 **Hrs./W: 4+2** **Max. Marks: 100**

Course Prerequisites: Basic Knowledge of Mathematics and Algebra

Course Description: This course helps the students to organize and present the data in a visual form and to establish the relationship between the variable for quantitative as well as qualitative nature of data.

COURSE OBJECTIVES:

CO 1	Organize, manage and present data and to analyze statistical data graphically using frequency distributions and cumulative frequency distributions
CO 2	Concept of Principle of least squares and fitting of curves viz., polynomials, exponential and power curves
CO 3	Bivariate data- graphical representation, frequency distribution, conditional frequency distribution. Karl Pearson's Correlation coefficient, Spearman's Rank Correlation Coefficient and its properties.
CO 4	Regression line and its properties, diagnostics of regression line, Multiple correlation, Partial correlation and multiple regression lines for trivariate data

CO 5	Dealing attributive nature of data, classification and its frequencies, consistency, independency and association of attributes and their properties

Expected Learning Outcomes: At the end of the course, the student will

1) Acumen to organize and present the data in a visual form.

2) Able to identify the association between the variables and establish the mathematical model

3) Law of dichotomous and relationship between attributes.

UNIT – I **(12hrs)**

Moments, central and non-central moments, and their interrelationships, Sheppard's corrections for moments for grouped data. Measures of skewness based on quartiles and moments and kurtosis based on moments with real life examples.

UNIT – II **(8hrs)**

Principle of least squares, fitting of: straight line ($y= ax+b$), quadratic ($y=ax^2+bx+c$), power curve ($y=ax^b$) and exponential curves ($y=ab^x$, $y=ae^{bx}$)

UNIT – III **(16hrs)**

Bivariate Data: Scatter diagram, marginal, graphical representation of marginal as well as bivariate frequency table, conditional frequencies, conditional empirical distributions, and conditional mean. Product moment correlation coefficient and its properties. Coefficient of determination. Correlation ratio, Spearman's Rank correlation and its properties.

UNIT – IV **(12hrs)**

Fitting of simple linear regression and related results, Concept of error in regression line Multivariate data: Multiple regression line, multiple correlation and partial correlation for tri-variate data.

UNIT – V **(12hrs)**

Analysis of Categorical Data: Consistency of categorical data. Independence and associations of attributes. Various measures of association for two-way classified data.

BOOKS FOR STUDY:

1. Mathematical statistics John E Freund, Ronald E Walpole PHI publications
2. Fundamentals of Mathematical Statistics, VK Kapoor, SC Gupta, Sultan Chand, New Delhi.
3. Statistics: A Beginner's Text Vol. I, Bhat BR, Srivenkataramana T and Rao Madhava KS, New age international (P) Ltd.
4. Statistics first year Telugu academy

BOOKS FOR REFERENCE:

1. Probability and Statistics in Engineering - Hines, Montgomery et al John Wiley sons
2. Fundamentals of statistics, Goon AM, Gupta MK, das Gupta B, World Press, Calcutta.
3. Introduction to the theory of Statistics, Mood AM, Graybill FA and Bose DC, McGraw Hill.

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

List of Practical's

On successful completion of the course, students will be able to

- ***Identify the basic characteristics to the givendata.***
- ***Fit mathematical models to the given data***
- ***Measure of association for a bivariate data.***

1. Moments, skewness and kurtosis
2. Fitting of straight line
3. Fitting of Parabola
4. Fitting of Power curve

5. Fitting of Exponential curves
6. Correlation
7. Regression
8. Association and independence of attributes

Co-Curricular Activities in the class:

1. Interactive Sessions
2. Concepts relates to the day to day events/ real world examples

Year of Revision: 2021-22 **(Revised CBCS- APSCHE)** Percentage of Revision: Nil

II B.A./B.Sc. – SEMESTER III **Course Code: STA-233-SMS**

Course Title:STATISTICAL METHODS& EXACT SAMPLING DISTRIBUTIONS

Total Hrs./Semester: 60 **Hrs./W: 4+2** **Max. Marks: 100**

Course Prerequisites: Calculus, Algebra and probability theory and its distributions

Course Description: This course helps the students to establish the association and relationship between the variables for quantitative data and also qualitative data.To learn the concepts of sampling, estimation, sampling distributions and methods of parametric estimation.

COURSE OBJECTIVES:

CO 1	Bivariate data- graphical representation, frequency distribution, conditional frequency distribution. Karl Pearson's Correlation coefficient, Spearman's Rank Correlation Coefficient and its properties.
CO 2	Regression line and its properties, diagnostics of regression line, Multiple correlation, Partial correlation and multiple regression lines for trivariate data
CO 3	Dealing attributive nature of data, classification and its frequencies, consistency, independency and association of attributes and their properties
CO 4	Concept of population, sample, parameter and statistic. Sampling distribution of data and basic sampling distribution viz., t, F and Chi square and its properties and their interrelationships
CO 5	Concept of Estimation–properties of good estimator and methods of parametric estimation and confidence intervals

Expected Learning Outcomes: At the end of the course, the student will

1) establish the association and relationship between the variables for quantitative data and also qualitative data.
2) be able to estimate the parameters of various probability distributions

UNIT – I **(14hrs)**

Bivariate Data: Scatter diagram, marginal, graphical representation of marginal as well as bivariate frequency table, conditional frequencies, conditional empirical distributions, and conditional mean. Product moment correlation coefficient and its properties. Coefficient of determination. Correlation ratio, Spearman's Rank correlation and its properties

UNIT – II **(10hrs)**

Fitting of simple linear regression and related results, Concept of error in regression line Multivariate data: Multiple regression line, multiple correlation and partial correlation in three variables.(Applications only)

UNIT – III **(14hrs)**

Analysis of Categorical Data: Consistency of categorical data. Independence and associations of attributes. Various measures of association for two-way and three-way classified data, Odds ratio.

UNIT – IV **(8hrs)**

Concept of Population, parameter, random sample, Statistic. Definition of a random sample, concept of sampling distribution, Exact sampling distributions – Statements and properties of Student's t, χ^2, F - distributions and inter relation.

UNIT – V **(14hrs)**

Point estimate of a parameter, concept of bias and mean square error of an estimate, Criteria of a good estimator - consistency, unbiased-ness, efficiency and sufficiency, Statement of Cramer-Rao Inequality, MVB of the estimator of the parameter of Binomial with a given 'n', Poisson, Normal with known 'σ'. Statement of Fisher-Neymann Factorization theorem,

sufficient statistics of parameters of Binomial, Poisson, Normal and Exponential cases (one parameter only), Estimation by the method of moments, Maximum Likelihood (ML) method and the statements of optimum properties of MLE's, Confidence intervals for parameters of Normal population (for large sample).

BOOKS FOR STUDY:

1. Mathematical statistics John E Freund, Ronald E Walpole PHI publications
2. Fundamentals of Mathematical Statistics, VK Kapoor, SC Gupta, Sultan Chand,
3. Statistics second year Telugu academy

BOOKS FOR REFERENCE:

1. Mathematical Statistics, Freund JE, prentice Hall of India.
2. Probability and Statistics in Engineering - Hines, Montgomery et al John Wiley sons
3. Fundamentals of statistics Vol.II, Goon AM, Gupta MK, das Gupta B, World Press, Calcutta.
4. Introduction to the theory of Statistics, Mood AM, Graybill FA and Bose DC, McGraw Hill.
5. An Introduction to Probability Theory and Mathematical Statistics, Rohatgi VK, John Wiley & Sons

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

Computer Lab- MS Excel-List of Practical's

On successful completion of the course, students will be able to

- ***Numerical measure of association for a bivariate data.***
- ***Cause and effect relationship for bivariate data.***
- ***Cause and effect relationship for tri-variate data.***

1. Karl Pearson's Correlation Coefficient
2. Spearman's Rank Correlation Coefficient
3. Linear Regression line
4. Partial Correlation Coefficient
5. Multiple Correlation Coefficient
6. Plane of Regression for tri variate data
7. Coefficient of Association and Colligation
8. Independence of attributes

Co-Curricular Activities in the class:

1. Interactive Sessions
2. Establishing mathematical relationship for various data sets.

Year of Introduction: 2021-22(Revised CBCS- APSCHE) Percentage of Revision: Nil

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

II B.A./B.Sc. – SEMESTER III **Course Code: STA-235-AS**

Course Title: APPLIED STATISTICS

Total Hrs./Semester: 60 **Hrs./W: 4+2** **Max. Marks: 100**

Course Prerequisites: Basic Knowledge of Mathematics, Calculus, Algebra and basic probability theory

Course Description: This course helps the students to understand the basic applied statistics like time series, index numbers, vital statistics and growth curves

Course Objectives:

CO 1	Understand census data, Fertility and Mortality rates, standardized death rates, components of complete and abridged life table, reproduction rates. Notation of population projection.
CO 2	Able to understand the different components of time series, analysis of time series data and measurement of trend and its applications.
CO 3	Analysis of time series data and measurement of seasonal variations – methods and its applications. Use of multiplicative model in measurement of seasonal fluctuations.
CO 4	Understanding the Concept of Index numbers, calculation of unweighted and weighted different index numbers for price and quantity, construction of cost of living index number and whole sale price index numbers.
CO 5	Understanding the Concept of demand and supply, price elasticities of supply and demand, methods of determining demand and supply curves and Pareto law of income distribution curves of concentration

Expected Learning Outcomes: At the end of the course, the student will

1) Be able to analyze the time series data and to construct the index numbers for business and economic data
2) Understand the demographic nature of vital statistics

UNIT-I **(12hrs)**

Sources of population data, census, rates and ratios. Fertility and mortality tares, standardized death rates, components of complete and abridged life table, reproduction rates. Notion of population projection.

UNIT-II **(12hrs)**

Introduction and applications of time series data, Components of time series- trend, Periodic changes & Irregular components, Analysis of time series data, Measurement of trend- graphic method, method of semi averages, moving averages, curve fitting-linear , quadratic, Power and exponential curves by principle of least squares.-Limitations.

UNIT-III **(12hrs)**

Measurement of Seasonal Fluctuations- method of simple averages, ratio to moving average method, ratio to trend, Link relative's methods. Use of multiplicative model in measurement of Seasonal Fluctuations.

UNIT-IV **(12hrs)**

Growth curves**:** Modified exponential curve, Logistic curve and Grompertz curve, fitting of growth curves by the method of three selected points and partial sums.Detrending. Effect of elimination of trend on other components of the time series.

UNIT-V **(12hrs)**

Construction and uses of simple and weighted index numbers, reversal tests of index numbers. Fisher's ideal index number, Base shifting and splicing. Construction of cost of living index number and wholesale price index number

BOOKS FOR STUDY:

1. Applied Statistics S.C.Gupta, V.K.Kapoor Sultan Chand & Co, New Delhi.
2. Applied Statistics- Parimal Mukhopadhyay New Central Book Agency
3. Applied Statistics- Telugu Academy Hyderabad

BOOKS FOR REFERENCE:

1. Fundamentals of Statistics (2000), Vol.2., Goon,A.M. Gupta, M.K. and Das Gupta, B. World Press, Calcutta.
2. Basic Statistics B.L Agarwal Asia New Age Publications
3. Statistical Methods - SP Gupta, Sultan Chand and Sons

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

List of Practical's

On successful completion of the course, students will be able to

- *Identify the basic characteristics of Vital Statistics.*
- *Fit the forecasting models (linear models) for time series data.*
- *Calculate the price and quantity indices of the given data.*

1. Mortality rates/Death rates
2. Fertility rates/Birth rates
3. Life tables
4. Measurement of trend by using moving averages method
5. Measurement of trend by using Principles of least squares.
6. Ratio to moving averages method
7. Ratio to trend method
8. Link relatives method
9. Index Number
10. Fisher's Ideal Index Number

Co-Curricular Activities in the class:

1. Interactive Sessions
2. analyze the time series data and to construct the index numbers for data sets

Year of Introduction: 2020-21 **Percentage of Revision: NIL**

(For Big Data Analysis and Artificial Intelligence)

ANDHRA LOYOLA COLLEGE (AUTONOMOUS):: VIJAYAWADA

II B.Sc. – SEMESTER III **Course Code: STA-233-PD**

Course Title: PROBABILITY DISTRIBUTIONS

Total Hrs./Semester: 60 **Hrs./W: 4+2** **Max. Marks: 100**

Course Prerequisites: Basic Knowledge of Mathematics, Calculus, Algebra and basic theory of probability

Course Description: This course helps the students to study the various discrete and continuous probability distributions and their characteristics.

Course Objectives:

CO 1	Univariate discrete probability distributions viz., Bernoulli Binomial and Poisson distributions, properties and their applications
CO 2	Univariate discrete probability distributions viz., Negative Binomial, Geometric and Hypergeometic distributions, properties and their applications
CO 3	Univariate continuous probability distribution - Normal distribution properties and its applications, standard normal variate, problems on normal area property
CO 4	Univariate continuous probability distributions viz., Cauchy, Exponential, Gamma and Beta Hypergeometic distributions, properties and their applications
CO 5	Concept of population, sample, parameter and statistic. Sampling distribution of data and basic sampling distribution viz., t, F and Chi square and its properties and their interrelationships

Expected Learning Outcomes: At the end of the course, the student will

1) have an idea of discrete probability distributions and its characteristics and applications
2) have an idea of continuous probability distributions and its characteristics and applications

UNIT – I **(12hrs)**

Univariate discrete distributions: Discrete Uniform, Bernoulli, Binomial, Poisson and their mgf, cf, first four moments, skewness, kurtosis, additive property (if exists), recurrence relation of central moments.

UNIT – II **(14hrs)**

Univariate discrete distributions: Hyper geometric, Negative Binomial distributions and Geometric distribution and their mgf, cf, first four moments, skewness, kurtosis, additive property (if exists), recurrence relation of central moments.

UNIT – III **(14hrs)**)

Continuous univariate distributions: Uniform, Normal distribution their definitions, properties and its importance in statistics, Mean, Median, Mode, mgf, cf and additive property (if exists), Applications of Area property.

UNIT – IV **(12hrs)**

Continuous univariate distributions: Cauchy, Exponential, Gamma distributions - their definitions, properties and its importance in statistics, Mean, Median, Mode, mgf, cf and additive property, (if exists).

UNIT – V **(8hrs)**

Exact sampling distributions – Statements and properties of Student's t, Chi Square (χ^2), F - distribution and its applications

BOOKS FOR STUDY:

1. Fundamentals of Mathematical Statistics,VK Kapoor, SC Gupta, Sultan Chand, New Delhi.
2. Statistics first year Telugu academy
3. Mathematical statistics John E Freund, Ronald E Walpole PHI publications

BOOKS FOR REFERENCE:

1. Probability and Statistics in Engineering - Hines, Montgomery et al John Wiley sons
2. Fundamentals of statistics Vol.II, Goon AM, GuptaMK, DasGuptaB,World Press, Calcutta.
3. Introduction to probability theory, Walpole
4. Statistics: A Beginner's Text Vol. I, Bhat BR, Srivenkataramana T and Rao Madhava KS, New age international (P) Ltd.

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

List of Practical's

On successful completion of the course, students will be able to

- ***Learn to fit Probability models (Discrete and Continuous Distributions) for practical data.***

1. Fitting of Binomial Distribution-Direct method
2. Fitting of Poisson Distribution-Direct method
3. Fitting of Negative Binomial Distribution- Direct method
4. Fitting of Geometric Distribution.
5. Fitting of Hyper Geometric Distribution
6. Fitting of exponential Distribution
7. Fitting of Normal Distribution-Direct method
8. Fitting of Normal Distribution- Recurrence Relation method

Co-Curricular Activities in the class:

1. Interactive Sessions
2. Fitting of probability distributions for a frequency distribution data

Year of Introduction: 2021-22 **Percentage of Revision: Nil**

(For Big Data Analysis and Artificial Intelligence)

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

DEPARTMENT OF STATISTICS

III B.Sc. – SEMESTER V **Course Code: STA-355BDAI-AS**

Course Title: APPLIED STATISTICS

Total Hrs./Semester: 60 **Hrs./W: 4+2** **Max. Marks: 100**

Course Prerequisites: Basic Knowledge of Mathematics, Calculus, Algebra and basic probability theory

Course Description: This course helps the students to understand the basic applied statistics like Sampling techniques, analysis of variance, time series, index numbers and statistical quality control

Course Objectives:

CO 1	Concept of population and sample, census and sample survey, sampling errors, probability and non probability sampling techniques. Simple random sampling, Stratified and Systematic sampling and their properties
CO 2	Select and design an appropriate method of data collection for a research project; Apply basic principles in the design of simple experiments viz., ANOVA, CRD and RBD designs
CO 3	Able to understand the different components of time series, analysis of time series data and measurement of trend and its applications.
CO 4	Understanding the Concept of Index numbers, calculation of unweighted and weighted different index numbers for price and quantity, construction of cost of living index number and whole sale price index numbers.
CO 5	Idea of Statistical Quality Control (SQC), process and product control, 3 sigma limits and control charts for attributes and variables

Expected Learning Outcomes: At the end of the course, the student will

1) be able to analyze the time series data and to construct the index numbers for business and economic data
2) understand the concept of statistical quality control

Unit-I **(12hrs)**

Sampling and sample surveys, concepts of population and sample, need for sampling, census and sample survey, basic concepts in sampling, Non sampling errors, advantages of sampling over complete census, limitations of sampling. Some basic sampling methods - simple random sampling with and without replacement, Stratified random sampling and systematic sampling.

Unit-II **(12hrs)**

Analysis of variance for one-way & two-way classifications, Need for design of experiments, fundamental principles of experimentation – randomization, replication and local control. Description and analysis of variance of Completely Randomized Design (CRD), Randomized Block Design (RBD).

Unit-III **(12hrs)**

Introduction, uses and applications of time series. Components of time series- Long term movements or trend, Short term Movements (Seasonal Variations, Cyclic Variations), Random or Irregular components. Analysis of time series data, Measurement of trend-graphical method, semi averages method, moving averages, and principle of least squares.

Unit-IV **(12hrs)**

Construction and uses of simple and weighted index numbers, reversal tests of index numbers. Fisher's ideal index number, Base shifting and splicing. Construction of cost of living index number and wholesale price index number.

Unit-V **(12hrs)**

Statistical Quality Control: Introduction, process control. Product control, control charts-Construction and Statistical basis of 3-σ Control charts, Control charts for variables: X-bar &R-chart, X-bar & s-chart. Control charts for attributes: np-chart, p-chart, c-chart and u-chart. Comparison between control charts for variables and control charts for attributes.

BOOKS FOR STUDY:

1. Sampling Techniques, Cochran
2. Applied Statistics S.C.Gupta, V.K.Kapoor Sultan Chand & Co, New Delhi.
3. Applied Statistics- Parimal Mukhopadhyay New Central Book Agency
4. Applied Statistics- Telugu Academy Hyderabad
5. Montogomery, D. C. (2009): Introduction to Statistical Quality Control, 6th Edition,
6. Wiley India Pvt. Ltd.

BOOKS FOR REFERENCE:

1. Fundamentals of Statistics (2000), Vol.2., Goon,A.M. Gupta, M.K. and Das Gupta, B. World
2. Press, Calcutta.
3. Basic Statistics B.L Agarwal Asia New Age Publications
4. Statistical Methods - SP Gupta, Sultan Chand and Sons
5. Design of experiments- Montogomary.

List of Practical's

- ***Apply the sampling methods with specified parameters.***
- ***Carry out the testing of homogeneity of several populations***
- ***Fit the forecasting models (linear models) for time series data.***
- ***Calculate the price and quantity indices of the given data***
- ***Learn the basic idea of Control charts.***
- ***Apply the Statistical Quality Control techniques to the industrial problems***

1. Simple Random Sampling
2. Stratified Random Sampling
3. Completely Randomized Design
4. Randomized Block Design
5. Measurement of trend by using moving averages method
6. Fisher's Ideal Index Number

7. Control chart for mean and Standard deviation
8. Control chart for number of defectives

Co-Curricular Activities in the class:

1. Interactive Sessions
2. Drawing sampling from population and analyze the time series data and to construct the index numbers for data sets

Year of Revision:2022-23 Percentage of Revision:30

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

B.Sc.– SEMESTERV **CourseCode:STA-356-OR**

CourseTitle:OPERATIONSRESEARCH

TotalHrs./Semester:60 **Hrs./W:3+3** **Max.Marks:100**

Course Prerequisites: Basic Knowledge of Mathematics, Algebra, Matrix theory and basic probability theory

Course Description: This course helps the students to lean the origin and development of OR and fundamental concepts and its applications of assignment, transportation, sequencing and game theory

Course Objectives:

CO 1	On completion of this unit,students are able to formulate the Linear Programming Problem (LPP) and its mathematical solution to LPP through Simplex method,
CO 2	Understandtheconceptof Assignment problem,Formulation of mathematical model and to solveAssignmentproblems with Hungarianmethod.
CO 3	Understandtheconceptof Transportation problem,Formulation of mathematical model and to find initial basic feasible solution and optimal solution using Modified Distribution method.
CO 4	UnderstandtheconceptofSequencingProblem Johnsons algorithm for Processing n Jobs through two machines, processing n jobs through three machines, processing two jobs through m machines.
CO 5	Understandtheconceptof Competitive strategies, Principle of Minimax and Maximin rule, definitions of Saddle point, Pay off matrix, Zero Sum game and

	Value of the game, Dominance and modified dominance property and its applications

Expected Learning Outcomes: At the end of the course, the student will

1) be able to solve the problems of assignment, transportation and sequencing applications
2) be able learn the concepts of competitive strategies and its applications

UNIT-I **(12hrs)**

Introduction and Definition of General Linear Programming Problem(LPP), formulation of LPP, Simplex Method – Slack variables.Simplex Method – Slack variables, Simplex Method – Artificial variable techniques - Big M-Method, Two Phase Method.

UNIT-II **(12hrs)**

Assignment Problem – introduction, LP formulation of assignment problem, Hungarianmethodtosolvingassignmentproblem,balancedandunbalanced,minimizationand maximizationmodelsin assignmentproblem.

UNIT-III **(12hrs)**

Transportation Problem - Introduction, Linear programming, Matrix form of transportationproblem, finding an initial basic feasible solution (IBFS) by North West Corner Rule, Lowestcost Entry method, Vogel's approximation method, optimal solution by using MODI methodfor balanced and unbalanced, minimization and maximization objectives with non-degenerateIBFS modelin Transportation problem.

UNIT-IV **(12hrs)**

Sequencing Problem- Introduction, Principal Assumptions, Processing n Jobs through two-machines, processing n jobs through three machines. Graphical method for 2 jobs through m-machines.

UNIT-V **(12hrs)**

Game theory: Definition of Game, Zero-sum game, Saddle point, Value of Game,

Pay-offmatrixFundamental Theorem of 2X2 games, Dominance property and modified dominanceproperty(simpleproblems).

LISTOFBOOKS FORSTUDY:

1. Operationsresearch–S.D.Sharma
2. Operationsresearch–Taha.H.A.

LISTOFBOOKSFORREFERENCE:

1. Operationsresearch--Wagner
2. Operationsresearch–Kanthi Swaroop
3. Operationsresearch–V.K.Kapoor

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

SPSS – List of Practical's

1. Preparation of data files
2. Data screening and transformation
3. Descriptive statistics
4. Correlation Regression analysis
5. T-tests – Single mean, Two means and Paired t-test
6. ANOVA -One-way and Two wayClassification
7. Time Series- Trend analysis
8. Multiple regression line
9. Nonparametric techniques

Co-Curricular Activities in the class:

1. Interactive Sessions
2. Visualizing the industry problems in form of assignment, transportation and sequencing problems and its solutions

Year of Revision: 2022-23 Percentage of Revision: 100%

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

B.Sc.– SEMESTERV **CourseCode:STA-357-BDR**

CourseTitle: Basic Statistical Data Analysis Using R Programming

TotalHrs./Semester:60 **Hrs./W:3+3** **Max.Marks:100**

Course Prerequisites: Basic Knowledge of Mathematics and elementary concepts of programming language

Course Description: This course helps the students to lean the R environment and basic data types, formats. Drawing graphs, generating reports and basic statistical analysis of data.

Course Objectives:

CO 1	Get basic knowledge on data types, functions and packages in R.
CO 2	Understand the functioning of the data in R
CO 3	Apply R-functions to data visualization.
CO 4	Generate statistical analysis viz., fitting of curves and probability distribution using R.
CO 5	Importing data and code editing, applying Hypothesis testing and generate statistical analysis.

Expected Learning Outcomes: At the end of the course, the student will

1) Learn the basic operational knowledge on R programming.

2) Review the core topics in Statistics using R programming with application

Unit I:

R environment, R studio-console, environment, output, basic data types, vectors, strings, factors and data frames, R Functions-Numeric string and date functions, *object function, help function,* R packages- importing the packages in R.

UNIT II

Learn how to load data: - *Creating data types, generating data types, importing data types, saving format,* plot a graph viz. histograms (equal class intervals and unequal classintervals), box plot, stem-leaf, frequency polygon, pie chart, Ogives with graphical summariesof data

UNIT III

Generate automated reports giving detailed descriptive statistics, correlation and lines of regression

UNIT IV

Random number generation and sampling procedures. Fitting of polynomials and exponentialcurves.Application Problems based on fitting of suitable distribution, Normal probability plot.

UNIT V

Simple analysis and create and manage statistical analysis projects, import data, code editing,Basics of statistical inference in order to understand hypothesis testing and compute p-valuesand confidence intervals.

SUGGESTED READING:

1. The Essential R Reference, Mark gardener, Willey Publications. 2014.
2. R in action data analysis and graphics with R, Robert I. Kabacoff, Manning Publications, 2011.

Books for Reference

1. Gardener, M (2012) Beginning R: The Statistical Programming Language, Wiley Publications.
2. Braun W J, Murdoch D J (2007): A First Course in Statistical Programming with R. Cambridge University Press. New York

3. Statistics Using R, Sudha G. Purothi&ect, Narosa Publications, 2008

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

List of Practical's

- ***Learn the basic operational knowledge on R programming.***
- ***Review the core topics in Statistics using R programming with application.***

1. Graphical representation of the data. (Bar, Pie, and Histogram, Box plot and Stem).
2. Statistical distributions.
3. Descriptive statistics.
4. Parametric Hypothesis testing (one, two and paired t-tests)
5. Non-Parametric Hypothesis testing (Chi-Square test with Independence of Attributes)
6. Correlation coefficient and its interpretation.
7. Linear regression and its validity.
8. Testing Homogeneity of several populations (ANOVA one and two ways)

Year of Revision: 2022-23 Percentage of Revision: 100%

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

B.Sc.– SEMESTERV **CourseCode:STA-356-**

Course Title: OPERATIONSRESEARCH I

TotalHrs./Semester:60 **Hrs./W:3+3** **Max.Marks:100**

Course Prerequisites: Basic Knowledge of Mathematics, Algebra, Matrix theory and basic probability theory

Objective: The Objective of the paper is to introduce the basic concepts of Operational Research and linear programming to the students.

Learning Outcomes:

After learning this course, the student will be able

1. To know the scope of Operations Research
2. To link the OR techniques with business environment and life sciences
3. To convert real life problems into mathematical models
4. To find a solution to the problem in different cases
5. To inculcate logical thinking to find a solution to the problem

UNIT-I **(12hrs)**

Introduction of OR – Origin and development of OR – Nature and features of OR –Scientific Method in OR – Modeling in OR – Advantages and limitations of Models-General Solution methods of OR models – Applications of Operation Research. Linear programming problem (LPP) - Mathematical formulation of the problem - illustrations on Mathematical formulation

of Linear programming of problem. Graphical solution of linear programming problems. Some exceptional cases - Alternative solutions, Unbounded solutions, non-existing feasible solutions by Graphical method.

UNIT-II **(12hrs)**

General linear programming Problem (GLP) – Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case)

UNIT-III **(12hrs)**

Artificial variable technique - Big-M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.

UNIT-IV **(12hrs)**

Duality in Linear Programming –Concept of duality - Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Economic interpretation of duality, Relation between the solution of Primal and Dual problem (statements only). Using duality to solve primal problem. Dual Simplex Method.

UNIT-V **(12hrs)**

Post Optimal Analysis - Changes in cost Vector **C** , Changes in the Requirement Vector **b** and changes in the Coefficient Matrix **A**. Structural Changes in a LPP.

LISTOFBOOKS FORSUDY:

3. Operationsresearch–S.D.Sharma
4. Operationsresearch–Taha.H.A.

Reference Books:

1. S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmohn, Operations Research, Sultan Chand and sons, New Delhi.
3. J.K. Sharma, Operations Research and Application, Mc.Millan and Company, New Delhi.
4. GassS.I : Linear Programming. Mc Graw Hill.
5. HadlyG : Linear programming. Addison-Wesley.
6. Taha H.M: Operations Research: An Introduction : Mac Millan.

Practical/Lab to be performed on a computer using OR/Statistical packages

1. To solve Linear Programming Problem using Graphical Method with
   (i) Unbounded solution
   (ii) Infeasible solution
   (iii) Alternative or multiple solutions.
2. Solution of LPP with simplex method.
3. Problem solving using Charnes-M method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
   (i) Unrestricted variables
   (ii) Unbounded solution
   (iii) Infeasible solution
   (iv) Alternative or multiple solutions.
6. Problems based on Principle of Duality.
7. Problems based on Dual simplex method.
8. Problems based on Post Optimal Analysis.

Co-Curricular Activities in the class:

1. InteractiveSessions
2. Visualising the industry problems in form of LPP.

Year of Revision: 2022-23 Percentage of Revision: 100%

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

B.Sc.– SEMESTERV **CourseCode:STA-357-**

CourseTitle:OPERATIONSRESEARCH II

TotalHrs./Semester:60 **Hrs./W:3+3** **Max.Marks:100**

Course Prerequisites: Basic Knowledge of Mathematics, Algebra, Matrix theory and basic probability theory

Course Description: This course helps the students to lean the fundamental concepts and its applications of assignment, transportation, sequencing and game theory

Learning Outcomes:

After learning this course, the student will be able

1. To solve the problems in logistics
2. To find a solution for the problems having space constraints
3. To minimize the total elapsed time in an industry by efficient allocation of jobs to the suitable persons.
4. To find a solution for an adequate usage of human resources
5. To find the most plausible solutions in industries and agriculture when a random environment exists.

UNIT -I

Transportation Problem - Introduction, Mathematical formulation of Transportation problem. Definition of Initial Basic feasible solution of Transportation problem - North-West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution-MODImethod(U-V method). Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization TP. Transhipment Problem.

UNIT-II

Assignment Problem - Introduction, Mathematical formulation of Assignment problem, Reduction theorem (statement only), Hungarian Method for solving Assignment problem, Unbalanced Assignment problem. The Traveling salesman problem, Formulation of Traveling salesman problem as an Assignment problem and Solution procedure.

UNIT-III

Sequencing problem: Introduction and assumptions of sequencing problem, Sequencing of n jobs and one machine problem. Johnson's algorithm for n jobs and two machines problem-problems with n-jobs on two machines, Gantt chart, algorithm for n jobs on three machines problem- problems with n- jobs on three machines, algorithm for n jobs on m machines problem, problems with n-jobs on m-machines. Graphical method for two jobs on m–machines.

UNIT-IV

Network Scheduling: Basic Components of a network, nodes and arcs, events and activities– Rules of Network construction – Time calculations in networks - Critical Path Method (CPM) and PERT.

UNIT –V

Game Theory: Two- person zero-sum games. Pure and Mixed strategies. Maxmin and Minimax Principles - Saddle point and its existence. Games without Saddle point-Mixed strategies. Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property.

LISTOFBOOKS FORSUDY:

1. Operationsresearch–S.D.Sharma
2. Operationsresearch–Taha.H.A.

Reference Books:

1. S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmohn, Operations Research, Sultan Chand and sons, New Delhi.
3. J.K. Sharma, Operations Research and Application, Mc.Millan and Company, New Delhi.
4. Gass: Linear Programming. Mc Graw Hill.
5. Hadly :Linrar programming. Addison-Wesley.
6. Taha : Operations Research: An Introduction : Mac Millan.
7. Dr.NVS Raju; Operations Research, SMS education,

Websitesof Interest: http://onlinestatbook.com/rvls/index.html

Practical/Lab to be performed on a computer using OR/Statistical packages

1. IBFS of transportation problem by using North- West corner rule, Matrix minimum method and VAM
2. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases)
3. Solution of Assignment problem using Hungarian method (both maximization and minimization cases),
4. Solution of sequencing problem—processing of n jobs through two machines
5. Solution of sequencing problem - processing of n jobs through three machines
6. To perform Project scheduling of a given project (Deterministic case-CPM).
7. To perform Project scheduling of a given project (Probabilistic case-PERT).
8. Graphical method of solving for m x 2 and 2 x n games.
9. Solution of m x n games by dominance rule.
10. Linear programming method for solving m x n games.

Co-Curricular Activities in the class:

1. InteractiveSessions.
2. Visualizing the industry problems in form of assignment, transportation and sequencing problems and its solutions.

Year of Revision: 2022-23 Percentage of Revision: 100%

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

B.Sc.– SEMESTERV **CourseCode:STA-356-SQC**

CourseTitle:Statistical Process and Quality Control

TotalHrs./Semester:60 **Hrs./W:3+3** **Max.Marks:100**

Course Objectives: To understand the concept of quality, process control and product control using control chart techniques and sampling inspection plan. To have an idea about quality management, quality circles, quality movement and standardizations for quality.

Learning Outcomes:

After learning this course, the student will be able

1. To define 'quality' in a scientific way
2. To differentiate between process control and product control
3. To speak about quality awareness in industry
4. To pave a path to an industry to meet the standards
5. To effectively implement various plans to control the quality standards at various stages of an industry.

Unit I

Meaning of quality, concept of total quality management (TQM) and six-sigma, ISO, comparison between TQM and Six Sigma, Meaning and purpose of Statistical Quality Control (SQC), Seven Process Control Tools of Statistical Quality Control (SQC) (i) Histogram (ii) Check Sheet, (iii) Pareto Diagram (iv) Cause and effect diagram(CED), (v)

Defect concentration diagram (vi) Scatter Diagram (vii) Control chart. (Only introduction of 7 tools is expected).

Unit II

Statistical basis of Shewhart control charts, use of control charts. Interpretation of control charts, Control limits, Natural tolerance limits and specification limits. Chance causes and assignable causes of variation, justification for the use of 3-sigma limits for normal distribution, Criteria for detecting lack of control situations:

(i) At least one point outside the control limits

(ii) A run of seven or more points above or below central line.

Unit III

Control charts for Variables: Introduction and Construction of $\bar{X}$ and R chart and Standard Deviation Chart when standards are specified and unspecified, corrective action if the process is out of statistical control.

Control charts for Attributes: Introduction and Construction of p chart, np chart, C Chart and U charts when standards are specified and unspecified, corrective action if the process is out of statistical control.

Unit IV

Acceptance Sampling for Attributes: Introduction, Concept of sampling inspection plan, Comparison between 100% inspection and sampling inspection. Procedures of acceptance sampling with rectification, Single sampling plan and double sampling plan.

Producer's risk and Consumer's risk, Operating characteristic (OC) curve, Acceptable Quality Level (AQL), Lot Tolerance Fraction Defective (LTFD) and Lot Tolerance Percent Defective (LTPD), Average Outgoing Quality (AOQ) and Average Outgoing Quality Limit (AOQL), AOQ curve, Average Sample Number (ASN), Average Total Inspection (ATI).

Unit V

Single Sampling Plan: Computation of probability of acceptance using Binomial and Poisson approximation, of AOQ and ATI. Graphical determination of AOQL, Determination of a single sampling plan by: a) lot quality approach b) average quality approach.

Double Sampling Plan: Evaluation of probability of acceptance using Poisson distribution, Structure of OC Curve, Derivation of AOQ, ASN and ATI (with complete inspection of

second sample), Graphical determination of AOQL, Comparison of single sampling plan and double sample plan.

Text Books:

1. **Montgomery, D. C. (2008)**: Statistical Quality Control, 6thEdn., John Wiley, New York.
2. **Parimal Mukhopadhyay:** Applied Statistics, New Central Book Agency.
3. **Goon A.M., Gupta M.K. and Das Gupta B. (1986):** Fundamentals of Statistics, Vol. II, World Press, Calcutta.
4. **S.C. Gupta and V.K. Kapoor:** Fundamentals of Applied Statistics – Chand publications.

References:

1. **R.C. Gupta:** Statistical Quality Control.
2. **Duncan A.J. (1974):** Quality Control and Industrial Statistics, fourth edition D.B. Taraporewala Sons and Co. Pvt. Ltd., Mumbai.
3. **Grant, E. L. and Leavenworth (1980):** Statistical Quality Control, fifth edition, Mc-Graw Hill, New Delhi.

Practical/Lab to be performed on a computer using Statistical packages

1. Construction of $\underline{X}$ and R Charts.
2. Construction of $\underline{X}$ and σ Charts.
3. Construction of p Charts for fixed sample size.
4. Construction of p Charts for variable sample size.
5. Construction of np Charts.
6. Construction of C charts.
7. Construction of U charts.
8. Single sampling plan for attributes (OC Curve, Producer's and Consumer's risks, AOQ, AOQL, ATI).
9. Determination of single sampling plan by: a) lot quality approach b) average quality approach.
10. Double sampling plan for attributes (OC curve, AOQ, AOQL, ATI, ASN using Poisson distribution).

Course 7B: **Computational Techniques and R Programming**

(Skill Enhancement Course(Elective), 05 Credits

Max.Marks: Theory :100 + Practicals: 50

Course Objectives: To learn the statistical analysis with the help of the statistical software R

Learning Outcomes:

After learning this course the student will be able

1.
2.
3.
4.
5.

Unit I

Computer basics: Introduction and brief history of evolution of computers, Classification of computers: special purpose and general purpose; analog, digital and hybrid; Super, main-frame etc.

Unit II

Organization of general purpose digital computers: CPU, main memory and peripherals. Mass storage devices and other I/O devices. Computer languages: Machine code language (machine language), assembly language and high level languages. Software: Operating systems, linker, loader, compiler, interpreter and assembler.

Unit III

Computer programming: Algorithm and flow-chart. Storage of information: concepts of records and files. File organization: sequential, relative and indexed.

Unit IV

Programming with R: Introduction to R, Data types in R (numeric, logical, character, complex etc.), R objects: vector, matrix, array, list, data frame, factor, and time series. Arithmetic, logical and relational operators, explicit and implicit looping, functions and functional programming in R, Lexical scoping rules in R, benefits of Lexical scoping, other scoping rules, debugging facility in R. Few important mathematical, statistical and graphical functions in R.

Unit V

Descriptive Statistics with R software: : Calculations with R software such as descriptive statistics, frequency distribution, Graphics and plots, statistical functions of central tendency, variation, skewness and kurtosis and illustration with examples.

Suggested Books

1. Chambers, J. (2008). Software for Data Analysis: Programming with R, Springer.
2. Crawley, M.J. (2017). The R Book, John Wiley & Sons.
3. Eckhouse, R.H. and Morris, L.R. (1975). Minicomputer Systems Organization, Programming and Applications, Prentice-Hall.
4. Matloff, N. (2011). The Art of R Programming, No Starch Press, Inc.
5. Peter N. (1986). Inside the IBM PC, Prentice-Hall Press.
6. Dr. Mark Gardener(2012): Beginning R The statistical Programming Languages, John Wiley & Sons.
7. Sudha G. Purohit, SharadD.Gore, and ShailajaR.Deshmukh (2008), Statistics Using R, Narosa Publishing House, India.
8. Crawley, M.J. (2006). Statistics – An introduction using R. John Wiley London.
9. Purohit, S.G., Deshmukh, S.R. and Gore, S.D., (2015): Statistics using R, Alpha Science International.
10. Verzani, J., (2018): Using R for introductory statistics. CRC press.
11. Schumacker, R.E., (2014): Learning statistics using R. Sage Publications.
12. Michale J. Crawley (2009), THE R BOOK, John Wiley & Sons.

Practical/Lab to be performed on a computer using R Software

1. Data visualization using R - frequency polygon, Ogives, Histogram.
2. Data visualization using R - simple and multiple bar diagram, pie chart.

3. Computation of Descriptive Statistics using R - Central Tendencies, Dispersions, Moments, Skewness and Kurtosis.
4. Computation of Karl Pearson's Coefficient of Correlation and Rank Correlation using R.
5. Construction of Control Charts for variables (X bar , R and σ) charts using R.
6. Construction of Control Charts for attributes (p, np charts with fixed and varying sample sizes) using R.
7. Construction of Control Charts using R - C and U charts.

Year of Revision: 2022-23 Percentage of Revision: 100%

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

B.Sc.– SEMESTERV **CourseCode:STA-356-**

CourseTitle: Econometrics

TotalHrs./Semester:60 **Hrs./W:3+3** **Max.Marks:100**

Learning Outcomes:

The course on econometrics will primarily focus on the use of statistical modelling and the relevant analyses to economic data problems. After learning this course the student will be able

1. various important econometric models and relevant model building concepts in econometrics
2. general linear models and estimation of inherent model parameters
3. multicollinearity, its detection and consequences and related inferential aspects
4. some advanced concepts of generalised least squares estimation, autocorrelation, its consequences, detection and strategy for reducing autocorrelation,
5. heteroscedasticity and its inherent concepts including its consequences,
6. some inferential aspects on heteroscedasticity,
7. practical aspects and real data illustration of the related problems.

Unit I

Basic Econometrics: Nature of econometrics and economic data, concept of econometrics, steps in empirical economic analysis, econometric model, importance of measurement in economics, the structure of econometric data, cross section, pooled cross section, time series and paired data, simple regression models, two variable linear regression model, assumptions estimations of parameters.

Unit II

Models and Estimations: Gauss marcoff theorem, OLS estimations, partial and multiple correlations coefficients. The general linear model assumptions, estimation and properties of estimators, BLUEs, and tests of significance of estimators, R square andANOVA.

Unit III

Problems in OLS Estimators: Multicollinearity: Introduction and concepts, detection of multicollinearity, consequences, tests and solutions of multicollinearity.

Unit IV

Autocorrelation: concept, consequences of autocorrelated disturbances, detection and solution of autocorrelation.

Unit V

Heteroscedastic disturbances: Concepts, Consequences of heteroscedasticity. Tests and solutions of heteroscedasticity. specification error, Errors of measurement.

References:

1. Gujarati, D. and Sangeetha, S. (2007). Basic Econometrics, 4th Edition, McGraw Hill Companies.
2. Johnston, J. (1972). Econometric Methods, 2nd Edition, McGraw Hill International.
3. Koutsoyiannis, A. (2004). Theory of Econometrics, 2nd Edition, Palgrave Macmillan Limited.
4. Maddala, G.S. and Lahiri, K. (2009): Introduction to Econometrics, 4th Edition, John Wiley & Sons.

Practical/Lab to be performed on a computer using Statistical packages

1. Problems based on estimation of General linear model.
2. Testing of parameters of General linear model.
3. Forecasting of General linear model.
4. Problems concerning specification errors.
5. Problems related to consequences of Multicollinearity.
6. Diagnostics of Multicollinearity.
7. Problems related to consequences of Autocorrelation (AR(I)).
8. Diagnostics of Autocorrelation.
9. Estimation of problems of General linear model under Autocorrelation.
10. Problems related to consequences Heteroscedasticity.
11. Diagnostics of Heteroscedasticity.
12. Estimation of problems of General linear model under Heteroscedastic distance terms.

Year of Revision: 2022-23 Percentage of Revision: 100%

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

B.Sc.– SEMESTERV **CourseCode:STA-357-**

CourseTitle: Regression Analysis

TotalHrs./Semester:60 **Hrs./W:3+3** **Max.Marks:100**

Learning Outcomes:

After learning this course the student will be able

1. To know about correlation and regression techniques, the two very powerful tools in statistics,
2. To get an idea of Linear and Multiple Linear regression,
3. To learn about regression diagnostics, multicollinearity, residual plots and estimation and tests for regression coefficients.
4. To study concept of coefficient of determination and inference on partial and multiple correlation coefficients.
5. To learn the regression with qualitative independent and dependent variables by dummy variable technique.
6. To learn the selection of the best regression model.

Unit I

Correlation: Bivariate data, Scatter diagram and interpretation. Karl Pearson's correlation coefficient, Properties. Spearman's rank correlation coefficient, with ties and without ties, limits. Regression, difference between correlation and regression.

Unit II

Steps in Regression Analysis: Assumptions of regression models. Simple linear regression model, Estimation of regression parameters by least squares method (fitting of regression model), Interpretation of parameters. Concept of residual, Residual plots. Multiple linear regression: Estimation of regression parameters by least square method, Interpretation of parameters. Concept of coefficient of determination.

Unit III

Regressions with Qualitative Independent Variables: Dummy variable technique — Testing structural stability of regression models comparing two regressions, interaction effects, seasonal analysis.

Unit IV

Regressions with Qualitative Dependent Variables: Piecewise linear regression, use of dummy variables, regression with dummy dependent variables; The LPM, Logit, Probit and Tobit models — Applications.

Unit V

Best Model: Selecting 'Best' regression model. All possible regressions – R^2, Adjusted R^2, MS_{Res}, Mallow's statistic. Sequential selection – forward selection, backward elimination.

References:

1. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis. 3rd Edition. John Wiley.
2. Hosmer, D. W., Lemeshow, S. and Sturdivant R.X. (2013). Applied Logistic Regression, Wiley Blackwell.
3. Montgomery, D. C., Peck, E. A. and Vining, G. G. (2013). Introduction to Linear Regression Analysis. 5th Edition. Wiley.
4. Neter, J., Kutner, M. H., Nachtsheim, C.J. and Wasserman, W. (1996). Applied Linear Statistical Models, 4th Edition, Irwin USA.
5. Gujarati, D. and Sangeetha, S. (2007). Basic Econometrics, 4th Edition

Practical/Lab to be performed on a computer using Statistical packages

1. Correlation coefficient
2. Rank correlation Coefficient
3. Regression Lines
4. Linear Models
5. Structural stability
6. Selecting best regression model by R^2
7. Selecting best regression model by Adjusted R^2
8. Selecting best regression model by MS_{Res}
9. Selecting best regression model by Mallow's statistic
10. Selecting best regression model by forward selection
11. Selecting best regression model by backward elimination.

Year of Revision:2021-22 Percentage of Revision:Nil

(Revised CBCS 2020-21 Batch onwards)

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

I BBA – SEMESTER I **Course Code: BBA-115-BS**

Course Title:BUSINESS STATISTICS

Total Hrs./Semester: 75 **Hrs./W: 5** **Max. Marks: 100**

Course Prerequisites: Basic Knowledge of Mathematics and Algebra

Course Description: This course helps the students to organize and present the data in a visual form and to establish the relationship between the variable.

COURSE OBJECTIVES:

CO 1	Organize, manage and present data and to analyze statistical data graphically using frequency distributions and cumulative frequency distributions.
CO 2	Statistical measures of central tendency and to apply the suitable average for analyzing the data
CO 3	Statistical measures of dispersion and to apply the suitable dispersion for analyzing and interpreting the numerical data
CO 4	Bivariate data- graphical representation, Karl Pearson's Correlation coefficient, Spearman's Rank Correlation Coefficient, regression lines and properties of regression coefficients.
CO 5	Analysis of time series data and measurement of seasonal variations – methods and its applications. Concept of Index numbers, calculation of unweighted and weighted different index numbers for price and quantity

Expected Learning Outcomes: At the end of the course, the student will

1) Acumen to organize and present the data in a visual form.

2) Able to identify the basic characteristics of the statistical data.

Unit – I: Introduction to Statistics	**15Periods**
Meaning, definition, functions, importance, limitations and distrust of statistics. Collection of data - primary data and secondary data - Direct personal investigation, indirect personal investigation, Information through correspondence, Questionnaire method. Classification of data- Types of classification. Frequency distribution. Tabulation of Data – Objects, characteristics and preparation of table. Graphic representation of Data – frequency graphs – simple, multiple percentages bar, pie diagram, histograms, frequency polygons. Frequency curve and Ogive.	
Unit – II: Measurement of Central Tendency	**15Periods**
Definition, objectives and characteristics of Mathematical Measures. Arithmetic Mean, Geometric mean and Harmonic mean – Individual series, Discrete Series and Continuous Series. Definition, Objectives and characteristics of Positional Measures – Median – quartiles, deciles, percentiles and Mode – Individual series, Discrete Series and Continuous series.	
Unit – III: Dispersion and skewness	**15Periods**
Dispersion – Meaning, definition, objectives of dispersion, Rang, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of variation. Skewness – Definition and objectives of Karl-Pearson and Bowley's Skewness	
Unit – IV: Correlation and Regression	**15Periods**
Correlation – Meaning and uses of correlation – Types of correlation – Karl Pearson correlation coefficient, Spearman's Rank Correlation. Regression – meaning and utility of regression analysis, Two Regression Equations – Regression Co-efficient and properties.	
Unit – V: Time Series Analysis and Index Numbers	**15Periods**
Time series – Meaning and Components – Classification. Index numbers – method of construction of Index numbers – Price Index numbers – Quantity Index numbers – test of adequacy of Index numbers – Deflation of Index numbers - Cost of Index numbers – Limitations of Index numbers.	

Books for Study:
Business Statistics – S.L. Aggarawal& S.L. Bhardwaj.
Statistical Methods – S.P. Gupta, Sultan Chand & Sons.
Quantitative Techniques – Obul Reddy, Chikkodi, Satya Prasad
Books for Reference:
1. Fundamental of Statistics – S.C.Gupta, Sultan Chand & Sons.
Websitesof Interest: http://onlinestatbook.com/rvls/index.html

Co-Curricular Activities in the class:

1. InteractiveSessions
2. analysis of time series and construction of Index number for economic data

Year of Introduction:2020-21 **Percentage of Revision:NIL**

(Revised CBCS 2020-21 Batch onwards)

LIFE SKILL COURSE

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

DEPARTMENT OF STATISTICS

I B.A. – SEMESTER I **Course Code: LSC111ES**

COURSE TITLE: ELEMENTARY STATISTICS

Total Hrs./Semester: 30 **Hrs./W: 2** **Max. Marks: 100**

Course Prerequisites: Elementary Knowledge of Mathematics and Algebra

Course Description: This course helps the students to organize and present the data in a visual form and to establish the relationship between the variable

COURSE OBJECTIVES:

On successful completion of the course, students will be able to

Objective:

- ***To provide basic understating of general statistical tools and their Elementary applications and to create awareness on Indian Statistical System.***

Learning outcomes

- ***Understand the concept of Statistics and its merits and demerits. Distinguishing Primary and secondary data. Classification, Tabulation and Pictorial representation of data.***
- ***Understand the basic nature of data and how a single value describes the entire data set. Measuring the degree of departure of a distribution from symmetry and Reveals the direction of scatterdness of the items.***
- ***Understand the spread of the data and to draw conclusions from the comparison of averages. To understand the concept of correlation and regression and to learn the degree of Association between two variables and establishing relationship between the variables.***

Expected Learning Outcomes: At the end of the course, the student will

1) Acumen to organize and present the data in a visual form.
2) Able to identify the basic characteristics of the statistical data.

UNIT-I **(10 hrs)**

Meaning, scope and limitations of StatisticsCollection of data: Primary and Secondary, Classification andTabulation, Construction of frequency distribution.Graphical Representation: Histogram, Bar, Pie and Frequency polygon.

UNIT-II **(10 hrs)**

Measures of Central Tendency: Features of good average, ArithmeticMean, Median, Mode. Empirical relationship between Mean Medianand Mode and skewness based on central values.

UNIT- III **(10 hrs)**

Measures of Dispersion: Range, Quartile Deviation (QD), MeanDeviation (MD), Variance, Standard Deviation (SD), relationshipBetween QD, MD and SD.

UNIT-IV **(08 hrs)**

Introduction to Bi-variate data, graphical representation of bi-variate data (scatter diagram), Karl Pearson's coefficient of Correlation.

UNIT-V **(08 hrs)**

Regression Introduction, Simple linear regression, regression coefficients, regression lines and their relationships.

BOOKS FOR STUDY:

1. Statistics (Theory, Methods, Application) D C Sancheti, V K Kapoor, Sultan Chand and
2. Sons, New Delhi
3. Statistical Methods, S.P. Gupta, Sultan Chand and Sons, New Delhi
4. Statistics (Theory and Practice) B.N Gupta, Sahitya Bhavan, Agra

Web sites for free download books for Statistics:

https://www.pdfdrive.com/introduction-to-statistics-books.html

http://www.freebookcentre.net/SpecialCat/Free-Statistics-Books-Download.html

https://bookboon.com/en/statistics-ebooks

http://onlinestatbook.com/Online_Statistics_Education.pdf

Year of Introduction:2020-21 **Percentage of Revision:Nil**

(Revised CBCS 2020-21 Batch onwards)

CERTIFICATE COURSE

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

DEPARTMENT OF STATISTICS

B.Sc. – SEMESTER I **Course Code: …….**

Course Title:INTRODUCTION TO BIOSTATISTICS

Total Hrs./Semester: 40 **Hrs./W: 2** **Max. Marks: 100**

About this course:

Introduction to Biostatistics provides an introduction to selected important topics in bio statistical concepts and reasoning. This course teaches the statistical methods and principles necessary for understanding and interpreting data used in public health and policy evaluation and formation. Topics include descriptive statistics, graphical data summary, sampling, statistical comparison of groups, correlation, and regression. While there are some formulae and computational elements to the course, the emphasis is on interpretation and concepts.

Course Prerequisites: Elementary Knowledge of Mathematics and Algebra

Course Description: This course helps the students to acquire the knowledge on collection and presentation of the data in a visual form and basic characteristics of statistical data. To establish relationship between variables and basic knowledge on testing of hypothesis.

COURSE OBJECTIVES:

On successful completion of the course, students will be able to

- Recognize and give examples of different types of data arising in public health and clinical studies

- Calculate and interpret the correlation between two variables.
- Calculate the simple linear regression equation for a set of data.
- Calculate and interpret confidence intervals for population means and proportions
- Perform a two-sample t-test and interpret the results; calculate a 95% confidence interval for the difference in population means
- Understand and interpret results from Analysis of Variance (ANOVA), a technique used to compare means amongst more than two independent populations
- Choose an appropriate method for comparing proportions between two groups; construct a 95% confidence interval for the difference in population proportions

Expected Learning Outcomes: At the end of the course, the student will

1) Acumen to acquire the knowledge on collection and presentation of the data.

2) Able to identify the basic characteristics of the statistical data.

UNIT- I: Introduction to Statistics (10hrs)

Statistical Data, Primary and Secondary data, Sources of Data, Sampling techniques, Classification of data, Frequency Distribution, Diagrammatic and Graphic Representation of data, Measures of central tendency: Mean, Median and Mode, Measures of Variability: Range, Standard Deviation.

UNIT -II: Correlation (08 hrs)

Introduction to Bi-variate data, graphical representation of bi-variate data (scatter diagram), Karl Pearson's coefficient of Correlation (One way table only)

UNIT -III: Regression (08 hrs)

Regression Introduction, Simple linear regression, regression coefficients, regression lines and their relationships.

UNIT -IV: Testing of Hypothesis I (10 hrs)

Introduction to Hypothesis Testing, Procedure of testing hypothesis, Type I and Type II Errors, Z-Test for means and proportions.

UNIT -V: Testing of Hypothesis II (10 hrs)

t-test, F-test, Chi-Square test; Analysis of Variance – One-Way and Two-way classification.

References:

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. New York.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Gupta
3. Blair R.C., Taylor, R.A. Biostatistics for the Health Sciences, Dorling Kindersley India Pvt., Ltd.
4. Statistical Methods, Gupta S.P., Sultan Chand & Sons.
5. Biostatistics for Pharmacy, Khan I.A. and Khanum, Uktal Publications.

Year of Introduction:2021-22 **Percentage of Revision:100**

ANDHRA LOYOLA COLLEGE (AUTONOMOUS) VIJAYAWADA

DEPARTMENT OF STATISTICS

(Revised CBCS 2020-21 Batch onwards)

B.Sc. – SEMESTER I **Course Code: STA-**

CERTIFICATE COURSE

COURSE TITLE:STATISTICS FOR MERCHANTS

Total Hrs./Semester: 40 **Max. Marks: 100**

Hrs./W: 4 **Total Credits: 4**

COURSE OUTCOMES: **On successful completion of the course, students will be able to;**

About this course

The primary goal of the course is to help students understand how the methods of statistics can be applied successfully to decision-making processes under uncertainty. This is accomplished by introducing students to the subjects of data collection, data summary, analyzing the data and using the results in decision making.

Course Objectives

Upon completion of the course, students are able to:

- Understand the different basic concept / fundamentals of business statistics.
- Understand the importance of measures of Descriptive statistics which includes measures of central tendency, Measures of Dispersion, Time Series Analysis, Index Number, Correlation and Regression analysis and their implication on Business performance.
- Understand the practical application of Descriptive Statistics concepts and their uses for Business Analytics.

UNIT- I: Introduction to Statistics **(10hrs)**

Statistical Data, Primary and Secondary data, Sources of Data, Sampling techniques, Classification of data, Frequency Distribution, Diagrammatic and Graphic Representation of data, Measures of central tendency: Mean, Median and Mode, Measures of Variability: Range, Standard Deviation.

UNIT -II: Correlation and Regression (10hrs)

Introduction to Bi-variate data, graphical representation of bi-variate data (scatter diagram), Karl Pearson's coefficient of Correlation (One way table only), Simple linear regression.

UNIT- III: Time series analysis (10hrs)

Concept, Additive and Multiplicative models, Components of time series, Trend analysis: Least Square method - Linear and Non- Linear equations, Applications in business decision-making.

UNIT- IV: Index Numbers (10hrs)

Meaning, Types of index numbers, uses of index numbers, Construction of Price, Quantity and Volume indices:- Fixed base and Chain base methods.

References:

1. G C Beri – Business Statistics, 3rd ed, TATA McGrawHill.
2. Chandrasekaran &Umaparvathi-Statistics for Managers, 1st edition, PHI Learning
3. Ken Black – Business Statistics, 5th ed., Wiley India
4. Levin and Rubin – statistics for Management, 7th ed., Pearson
5. S. CGupta – Fundamentals of Statistics, Himalaya Publishing