



BHAVAN'S VIVEKANANDA COLLEGE

of Science, Humanities and Commerce, Sainikpuri
Autonomous College | Affiliated to Osmania University
Accredited with 'A' Grade by NAAC

B Sc (MSCs) CBCS Statistics - Template (Wef academic year: 2020-21)

YEAR	SEMESTER	THEORY/ PRACTICAL	Paper Title	WORK LOAD (Hrs/ Week)	#CREDITS	MARK S	
I	FIRST	Paper-I	Descriptive Statistics and probability	4	4	100	
		<i>Practical-1</i>	<i>Descriptive Statistics and probability</i>	2	1	25	
	SECOND	Paper-II	Probability distributions	4	4	100	
		<i>Practical-2</i>	<i>Probability distributions</i>	2	1	25	
II	THIRD	SEC-1	Data Analysis with Python - I	2	2	50	
		SEC-2	Data Analysis with SPSS - I	2	2	50	
		Paper-III	Statistical Methods and Inference - I	4	4	100	
		<i>Practical-3</i>	<i>Statistical Methods and Inference - I</i>	2	1	25	
	FOURTH	SEC-3	Data Analysis with Python-II	2	2	50	
		SEC-4	Data Analysis with SPSS-II	2	2	50	
		Paper-IV	Statistical Inference - II	4	4	100	
		<i>Practical-4</i>	<i>Statistical Inference - II</i>	2	1	25	
III	FIFTH	<i>GE</i>		4	4	100	
		Paper-V	Applied Statistics-1	4	4	100	
		<i>Practical-5</i>	<i>Applied Statistics-1</i>	2	1	25	
	SIXTH						
		<i>Project/ Optional</i>			4	4	100
		Paper-VI	Applied Statistics-2	4	4	100	
<i>Practical-6</i>	Applied Statistics-2	2	1	25			

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Bharatiya Vidya
Bhavan**BHAVAN'S VIVEKANANDA COLLEGE**

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B.Sc. I Year (CBCS): Statistics Syllabus

(Examination at the end of I Semester)

(Wef academic year: 2020-21)

60hrs
(4hrs/ week)
4 Credits

Semester I**Course Name: Descriptive Statistics & Probability****Course Objectives:**

This course aims to,

COB1: Analyze and compare different sets of data using graphs, charts, tables, and numerical measures, and write about them in clear and precise sentences using statistical vocabulary.

COB2: Calculate and interpret the various descriptive measures for centrality and dispersion.

COB3: Provide strong foundation of probability theory and theorems including Bayes theorem.

COB4: Understand the concept of random variables, how to identify them and use them to solve probabilistic problems

UNIT - I**(15)**

Introduction: Importance of statistics, concepts of statistical population and a sample - quantitative and qualitative data - collection of primary and secondary data. Measurement scales- nominal, ordinal, interval and ratio. Classification and tabulation of data. Construction of univariate and bivariate frequency distributions. Diagrammatic and graphical representation of data. Designing a questionnaire and a schedule.

UNIT - II**(15)**

Descriptive Statistics: Measures of central tendency (mean, median, mode, geometric mean and harmonic mean) with simple applications. Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications.

Moments -Importance of 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 - III**(15)**

Probability: Basic concepts in probability—deterministic and random experiments, trial, outcome, sample space, event, and operations of events, mutually exclusive and exhaustive

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events, and equally likely and favorable outcomes with examples. Mathematical, statistical and axiomatic definitions of probability with merits and demerits. Conditional probability and Independent events. Addition and multiplication theorem for n events. Boole's inequality and Bayes' Theorem – numerical problems.

UNIT - IV

(15)

Random Variables: Definition of random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function with illustrations and expectation of a random variable and rules of expectation. Distribution function and its properties. Transformation of one-dimensional random variable (simple 1-1 functions only). Definition of moment generating function (m.g.f), cumulant generating function (c.g.f), probability generating function (p.g.f) and characteristic function (c.f) and statements of their properties with applications. Chebyshev's, and Cauchy-Schwartz's inequalities and their applications.

Course Outcomes:

Upon successful completion of the course, students able to:

- CO1:** *Develop skills in presenting quantitative and qualitative data using appropriate diagrams, tabulations and construction of frequency distributions.*
- CO2:** *Evaluate and interpret measures of central tendency, spread of data, central & Non central moments.*
- CO3:** *Utilize basic concepts of probability and theorems in probability including Bayes' theorem to calculate, interpret and communicate event probabilities.*
- CO4:** *Apply key concepts of probability, including discrete and continuous random variables, Probability functions, Generating functions, expectations and variances.*

List of Reference Books:

1. V.K. Kapoor and SC. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. William Feller: Introduction to Probability theory and its applications. Volume- I, Wiley
3. Goon A M, Gupta and Das Gupta B: Fundamentals of Statistics, Vol-I, the World press pvt. Ltd., Kolkata
4. Hoel PG: Introduction to Mathematical Statistics, Asia Publishing house.
5. M. Jagan Mahon Rao and Papa Rao: A Text book of statistics paper-I.
6. Sanjay Arora and Bansi Lal: New mathematical Statistics: Satya Prakashan, New Delhi
7. Hogg, Tanis, Rao: Probability and Statistical Inference. 7th edition, Pearson Publication.
8. Statistics for B.Sc I year, Telugu Academy.
9. Statistics for Management - Levin & Rubin

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B.Sc. IYear (CBCS): Statistics Syllabus

(Examination at the end of III Semester)

Semester I

Course Name: Descriptive Statistics & Probability – Practical

**30hrs
(2hrs/ week)
1 Credit**

List of practicals:

1. Computation of Measures of Central tendency (MS-Excel and R-Programming).
2. Computation of Measures of dispersion (MS-Excel and R-Programming).
3. Graphical Presentation of data (Histogram, Frequency polygon, Ogives) (MS-Excel and R-Programming).
4. Diagrammatic Presentation of data (Bar, Pie, Steam and Leaf, Box Plot) (MS-Excel and R-Programming).
5. Computation of non-central and central moments – Sheppard's correction for grouped data. (MS-Excel and R-Programming).
6. Computation of co-efficient of Skewness and Kurtosis (MS-Excel and R-Programming).

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(Examination at the end of I Semester)

(Wef academic year: 2020-21)

60hrs
(4hrs/ week)
4 Credits

Semester II

Course Name: Probability distribution

Course Objectives:

The objective of this course is,

- COB1:** *To learn the basic concepts of bivariate random variables, and derive the marginal and conditional distributions of bivariate random variables.*
- COB2:** *To apply the concepts of various discrete probability distributions to various business problems.*
- COB3:** *how to apply concepts of the Continuous probability distributions to find probabilities and applications.*
- COB4:** *To translate real-world problems into probability models and Solve the problems using appropriate tools.*

UNIT - I

(15)

Bivariate Random variables: Notion of bivariate random variable, bivariate distribution and statement of its properties. Joint, marginal and conditional distributions. Independence of random variables. Statement and applications of weak law of large numbers and central limit theorem for identically and independently distributed (i.i.d) random variables with finite variance.

UNIT - II

(15)

Discrete distributions: Uniform, Bernoulli, Binomial, Poisson, Negative binomial, Geometric and Hyper-Geometric (mean and variance only) distributions. Properties of these distributions such as m.g.f, c.g.f., p.g.f., c.f., and moments up to fourth order and their real life applications. Reproductive property wherever exists. Binomial approximation to Hyper-geometric, Poisson approximation to Binomial and Negative binomial distributions.

UNIT - III

(15)

Continuous distributions: Rectangular and Normal distributions. Importance of Normal distribution. Normal distribution as a limiting case of Binomial and Poisson distributions. Properties of these distributions such as m.g.f, p.g.f, c.g.f, c.f., and moments up to fourth order and their real-life applications

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UNIT - IV

(15)

Continuous distributions (Continued): Exponential, Gamma, Beta of two kinds (mean and variance only) and Cauchy (definition and c.f. only) distributions. Properties of these distributions such as m.g.f., c.g.f., c.f., and moments up to fourth order, their real-life applications and reproductive productive property wherever exists.

Course Outcomes:

Upon successful completion of the course, students able to:

CO1: Able to identify the basic concepts of probability including random variable, probability of an event, Independence and conditional probability for Bivariate Random Variables.

CO2: Learn the principle of several well-known discrete distributions, including Binomial, Poisson, Geometric, Hyper Geometric, Negative Binomial etc.

CO3: Define and calculate the probabilities of the continuous probability distributions

CO4: Determine the continuous probability distribution based on experiment conditions and assumptions (including the exponential, gamma, beta and Cauchy distributions).

List of Reference Books:

1. V.K.Kapoor and SC.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. William Feller: Introduction to Probability theory and its applications. Volume- I, Wiley
3. GoonAM, Gupta and Das Gupta B: Fundamentals of Statistics, Vol-I, the World press pvt.Ltd., Kolkata
4. Hoel PG: Introduction to Mathematical Statistics, Asia Publishing house.
5. M.Jagan Mahon Rao and Papa Rao: A Text book of statistics paper-I
6. Sanjay Arora and Bansi Lal: New mathematical Statistics: Satya Prakashan, New Delhi
7. Hogg, Tanis, Rao: Probability and Statistical Inference. 7th edition, Pearson Publication.
8. Statistics for B.Sc I year, Telugu Academy.
9. K.V.S. Sarma: statistics Made Simple: do it yourself on PC. PHI
10. Statistics for Management - Kevin & Rubin

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B.Sc. IYear (CBCS): Statistics Syllabus

(Examination at the end of III Semester)

Semester II**Course Name: Probability Distributions – Practical**

30hrs
(2hrs/ week)
1 Credit

List of practicals:

1. Computation of Binomial Probabilities (MS-Excel and R-Programming).
2. Computation of Poisson Probabilities (MS-Excel and R-Programming).
3. Computation of Exponential Probabilities (MS-Excel and R-Programming).
4. Computation of Normal Probabilities (R-Programming).
5. Computation of Cauchy Probabilities (MS-Excel and R-Programming).

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60 hrs
(4 hrs/ week)
4 Credits

B.Sc. II Year (CBCS): Statistics Syllabus

(Examination at the end of III Semester)

(To be implemented for the students joined in 2019-20)

Semester III

Course Name: Statistical Methods and Inference I

Course Objectives:

The objective of the course is,

COB1: To learn the concept of association between categorical variables and also to forecast the trend line.

COB2: To understand the concept of relationship between two variables and forecast future values by regression equations.

COB3: To Recognize the characteristics of a sampling distribution and aware of estimation.

COB4: To Understand the fundamentals of classical inference involving confidence intervals and hypothesis testing.

UNIT - I

(15)

Principle of least squares: Fitting of a straight line, quadratic, exponential and power curves.

Analysis of categorical data: Definition of attributes. Independence, association and partial association of attributes, various measures of association (Yule's) for 2 –way data and coefficient of contingency (Pearson and Tcherprow) and coefficient of colligation with real life examples.

UNIT - II

(15)

Correlation & Regression: Product moment correlation coefficient and its properties. Bivariate data, scattered diagram, computation of correlation coefficient for grouped data, Spearman's Rank correlation coefficient and its properties, correlation ratio. Partial and multiple correlation coefficients (only for three variables. Simple linear regression, lines of regression, properties of regression coefficients, correlation verses regression, Regression for three variables, coefficient of determination- R^2 .

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UNIT - III

(15)

Sampling distribution: Concept – Population, Sample, parameter, statistic, sampling distribution and standard error and its application. Definitions of exact sampling distributions-statements and properties of chi-square, t and F distributions and their interrelationships. Independence of sample mean and variance in random sampling from normal distributions.

Estimation: Point Estimation – Distinction between Estimator and Estimate – Properties of Estimators – Concept of Unbiasedness & Consistency, – Simple Applications.

UNIT - IV

(15)

Estimation : Efficiency and Sufficiency – Statement of Neyman's Factorization theorem

Methods of Estimation: Maximum likelihood estimator (MLE) and their properties – Simple problems on MLE – Method of moments – Simple illustrations.

Interval estimation – Concept, Distinction between point estimation and interval estimation - Confidence interval and confidence limits

Course Outcomes:

Upon successful completion of the course, students able to:

CO1: Demonstrate the applicability of analyzing the categorical data.

CO2: Compute and interpret Correlation Analysis, regression lines and multiple regression analysis with applications.

CO3: apply point and interval estimation techniques to estimate the population mean, proportion and variance.

CO4: compute various properties of estimation to deal real life problems.

List of Reference Books:

1. V.K.Kapoor and S.C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. William Feller: Introduction to Probability theory and its applications. Volume- I, Wiley
3. Goon A.M., Gupta M K., Das Gupta B: Fundamentals of Statistics, Vol-II, the World press pvt.Ltd., Kolkata.
4. Hoel PG: Introduction to mathematical Statistics, Asia Publishing house.
5. Sanjay Arora and Bansilal: New mathematical Statistics: Satya Prakashan, New Delhi
6. Hogg, Tanis, Rao: Probability and Statistical Inference. 7th edition. Pearson.
7. Parimal Mukhopadhyay: Mathematical Statistics. New Central Book Agency.

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30 hrs
(2hrs/ week)
1 Credit

B.Sc. II Year (CBCS): Statistics Syllabus

(Examination at the end of III Semester)

(To be implemented for the students joined in 2019-20)

Semester III

Course Name: Statistical Methods and Inference I- Practical

List of practicals:

1. Simulation of random samples from Uniform (0,1), Uniform (a,b), Exponential, Normal and Poisson distributions (MS Excel and R Programming).
2. Fitting of straight line and parabola by the method of least squares (MS Excel and R Programming).
3. Fitting of Exponential Curves by the method of least squares (MS Excel and R Programming).
4. Fitting of power curves by the method of least squares (MS Excel and R Programming).
5. Computation of correlation coefficient, forming regression lines (MS Excel and R Programming).
6. Computation of partial correlation coefficients (MS Excel and R Programming).
7. Computation of Multiple correlation coefficients (MS Excel and R Programming).

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60 hrs
(4 hrs/ week)
4 Credits

B.Sc. II Year (CBCS): Statistics Syllabus

(Examination at the end of IV Semester)

(To be implemented for the students joined in 2019-20)

Semester IV

Course Name: Statistical Inference II

Course Objectives:

This course aims to,

COB1: Understand the fundamentals of classical inference.

COB2: Demonstrate the use of large sample tests and its applications.

COB3: Understand the applications of exact sampling distributions.

COB4: Perceive an in-depth presentation and analysis of the most common methods and techniques of nonparametric statistics.

UNIT - I

(15)

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

UNIT - II

(15)

Large Sample Tests: Large sample tests for attributes and variables; confidence intervals for mean(s), proportion(s), standard deviation(s) and correlation coefficient(s).

UNIT - III

(15)

Small Sample Tests: Tests of significance based on χ^2 , t and F. χ^2 -test for goodness of fit, Single variance and test for independence of attributes. t - test for test for single mean, two mean (independent and dependent). F- test for difference of variances. Definition of order statistics and statement of their distributions.

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UNIT - IV**(15)**

Non-Parametric Tests: Their advantages and disadvantages, comparison with parametric tests. One sample run test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test, Wald Wolfowitz's runtest.

Course Outcomes:

Upon successful completion of the course, students able to:

CO1: *Apply various estimation and testing procedures to real life problems.*

CO2: *Acquire techniques to test hypotheses related to population means, proportions and variances under different circumstances.*

CO3: *Grab the knowledge of inferential statistics and their applications in real-life business situations.*

CO4: *Apply distribution free test to deal with real time problems.*

List of Reference Books:

1. V.K.Kapoor and SC.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Sanjay Arora and Bansi Lal: New mathematical Statistics: Satya Prakashan, New Delhi.
3. Hogg and Craig: Introduction to Mathematical Statistics. Printis Hall
4. Parimal Mukhopadhyay: Mathematical Statistics. New Central Book Agen
5. Goon AM, Gupta mk, Das Gupta B: Fundamentals of Statistics, Vol-II, the World press pvt.Ltd., Kolakota
6. Hoel PG: Introduction to mathematical Statistics, Asia Publishing house.
7. Hogg, Tanis, Rao: Probability and Statistical Inference. 7th edition. Pearson.
8. William Feller: Introduction to Probability theory and its applications. Volume- I, Wiley Publication
9. Sanjay Arora and Bansi Lal: New mathematical Statistics: Satya Prakashan, New Delhi.
10. Mood AM, Graybill FA, Boe's DC Introduction to theory of statistics. TMH.
11. Paramiteya mariyu aparameteya parikshalu. Telugu Academy.
12. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury. Thomson Learning
13. Levin, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel.
4th edition. Pearson Publication.

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B.Sc. II Year (CBCS): Statistics Syllabus

(Examination at the end of III Semester)

(To be implemented for the students joined in 2019-20)

Semester IV

Course Name: Statistical Inference II - Practical

30 hrs
(2hrs/ week)
1 Credit

List of practicals:

1. Test for single proportion (MS Excel and R Programming).
2. Test for difference between proportions (MS Excel and R Programming)
3. Test for single mean (MS Excel and R Programming).
4. Test for difference between means (MS Excel and R Programming).
5. Test for single variance (MS Excel and R Programming).
6. Test difference between variances (MS Excel and R Programming).
7. Test for correlation coefficient (MS Excel and R Programming).
8. χ^2 tests for goodness of fit (MS Excel and R Programming).
9. χ^2 tests for independence of attributes (MS Excel and R Programming).

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45hrs
(3hrs/ week)
3 Credits

B.Sc. III Year (CBCS): Statistics Syllabus

(Examination at the end of V Semester)

(To be implemented for the students joined in 2019-20)

Semester V

Course Name: Applied Statistics I

Course Objectives:

This course aims to,

COB1: learn techniques in survey sampling with practical applications in daily life this would be beneficial for the further research

COB2: understand the principles underlying sampling as a means of making inferences about a population.

COB3: understand the concept of various components of time series modeling.

COB4: Anticipate a value useful for comparing magnitudes of aggregates of related variables to each other, and to measure the changes in these magnitudes over

UNIT - I

(12)

Design of Sample Surveys: - Organization and execution of sample surveys - principle steps in sample survey - Pilot survey - sampling and non-sampling errors - advantages of sampling over complete census - limitations of sampling.

Sampling techniques: Subjective, probability and mixed sampling methods. Simple random sampling with and without replacement - unbiased estimate of the mean, variance of the estimate of the mean finite population correction estimation of standard error from a sample - determination of sample size. Estimates of population mean, total, and proportion, their variances and the estimates of variances by Simple Random Sampling with and without replacement (SRSWR and SRSWOR).

UNIT - II

(12)

Stratified random sampling - properties of the estimates - unbiased estimates of the mean and variance of the estimates of the mean-optimum and proportional allocations - relative precision of a stratified sampling and simple random sampling - estimation of gain in precision in stratified sampling.

Systematic Random Sampling: Systematic sampling with $N = nk$. Estimates of population mean, total, their variances and estimates of variances. Comparison of relative efficiencies and advantages and disadvantages of above methods of sampling.

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UNIT - III

(11)

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

UNIT - IV

(10)

Index Numbers: -Concept, construction, uses and limitations of simple and weighted index numbers. Weighted index numbers - Laspeyres's, Paasche's and Fisher's, Marshall Edgeworth and Kelly's index numbers. Criterion of a good index numbers (Test of consistency), problems involved in the construction of index numbers. Fisher's index as an ideal index number. Fixed and chain base index numbers. Cost of living index numbers and wholesale price index numbers. Base shifting, splicing and deflation of index numbers.

Official Statistics: - Functions and organization of CSO, and NSSO. Agricultural Statistics, area and yield statistics. National Income and its computation, utility and difficulties in estimation of National income.

Course Outcomes:

Upon successful completion of the course, students able to:

CO1: Understand distinctive features of sampling schemes and its applications in real life.

CO2: Estimate statistics of interest and the sample sizes are determined so that those statistics are estimated with an acceptable sampling error.

CO3: Understand the past behavior and would be helpful for future predictions.

CO4: Determining the direction of production and employment to facilitate future payments and to know changes in the real income of different groups of people at different places and times.

List of Reference Books:

1. Hoel PG: Introduction to mathematical statistics, Asia Publishing house.
2. VKRohatgi and A.K.Md.Ehsanes Saleh: An Introduction to probability and statistics. Wiley series.
3. Parimal Mukhopadhyay: Mathematical Statistics. New Central Book agency,
4. Sanjay Arora and Bansilal: New Mathematical Statistics Satya Prakashan, New Delhi.
5. Hogg and Craig: Introduction to Mathematical statistics. Printis Hall
6. Siegal. Sand Sidney: Non-parametric statistics for Behavioural Science, McGraw Hill,
7. Gibbons.J.D and Subhabrata Chakrabarti: Nonparametric Statistical Inference, MarcelDekker.
8. Conover: Practical Nonparametric Statistics. Wiley series.
9. Mood AM, Graybill FA, Boe's DC Introduction to theory of statistics. TMH.

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10. Paramiteya mariyu aparameteya parikshalu. Telugu Academy.
11. K.V.S. Sarma: Statistics Made simple do it yourself on PC. PHI
12. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury. Thomson Learning
13. Levin, Stephan, Krehbiel, Herenson: Statistics for Managers using Microsoft Excel, 4th edition. Pearson Publication.
14. Hogg, Tanis, Rao. Probability and Statistical Inference. 7th edition, Pearson Publication.
15. Milton and Arnold (fourth Edition): Introduction to Probability and statistics, Tata McGraw hill Publication

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1 Credit

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(Examination at the end of III Semester)

(To be implemented for the students joined in 2019-20)

Semester V

Course Name: Applied Statistics - Practical

Sampling Theory

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

Time Series

- 4a. Measurement of trend by method of moving averages.
- 4b. Measurement of trend by method of moving averages using MS Excel.
- 5a. Measurement of trend by method of least squares.
- 5b. Measurement of trend by method of least squares using MS Excel.
- 6a. Measurement of seasonal indices by the method of Ratio to trend.
- 6b. Measurement of seasonal indices by the method of Ratio to trend using MS Excel.
- 7a. Measurement of seasonal indices by the method of Ratio to moving averages.
- 7b. Measurement of seasonal indices by the method of Ratio to moving averages using MS Excel.
- 8a. Measurement of seasonal indices by the method of Link Relatives.
- 8b. Measurement of seasonal indices by the method of Link Relatives using MS Excel.

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Index Numbers

- 9a. Computation of Laspeyer's, Paasche's, Fisher's, Marshall Edgeworth and Kelly's Price and Quantity Index numbers
- 9b. Computation of Laspeyer's, Paasche's, Fisher's, Marshall Edgeworth and Kelly's Price and Quantity Index numbers using MS Excel.
- 10a. Computation of Time Reversal Test, Factor Reversal Test and Circular Test.
- 10b. Computation of Time Reversal Test, Factor Reversal Test and Circular Test using MS Excel.
- 11a. Construction of Cost of living index numbers.
- 11b. Construction of Cost of living index numbers using MS Excel
12. Base shifting, splicing and Deflation

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Autonomous College | Affiliated to Osmania University
Accredited with 'A' Grade by NAAC

45hrs
(3hrs/ week)
3 Credits

B.Sc. III Year (CBCS): Statistics Syllabus

(Examination at the end of V Semester)

(To be implemented for the students joined in 2019-20)

Semester V

Course Name: Statistical Quality Control & Reliability

Course Objectives:

The objective of this course is,

- COB1: To Analyze the quality problems and solve them. Monitoring and maintaining of the quality of products and services.*
- COB2: To Determine whether to accept or reject a production lot of material.*
- COB3: Ability to put the knowledge of the Six Sigma concepts to process improvement.*
- COB4: To Demonstrate the approaches and techniques to assess and improve process and/or product quality and reliability.*

UNIT - I

(13)

Statistical Quality Control:

Importance of SQC in industry. Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np, and c- charts with fixed and varying sample sizes). Interpretation of control charts. Natural tolerance limits and specification limits, process capability index.

UNIT – II

(12)

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

UNIT - III

(10)

Six Sigma: Six sigma- Overview, Foundations and principles of Six Sigma, Roles and responsibilities in Six Sigma Implementation, DMAIC / DMDAV methodology, Design for Six Sigma. Natural tolerance limits and specification limits, process capability index.

UNIT - IV

(10)

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

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Course Outcomes:

Upon successful completion of the course, students able to:

- CO1:** Demonstrate continuous improvement methodology for eliminating defects in a product, process or service.
- CO2:** Determine the quality of a batch of products by selecting a specified number for testing.
- CO3:** Provides organizations tools to improve the capability of their business processes.
- CO4:** Achieve a better way to balance the cost of failure reduction against the value of the enhancement.

List of Reference Books:

1. V.K.Kapoor and SC.Gupta : Fundamentals of Applied Statistics. Sultan Chand and sons, New Delhi.
2. D. C. Montgomery: Introduction to Statistical Quality Control, John Wiley & Son 2009.
3. S.K.Sinha: Reliability and life testing. Wiley Eastern.
4. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.
5. S.M.Ross: Probability Models. Harcourt India PVT.Ltd..
6. Parimal Mukhopadhyay: Applied Statistics. New Central Book agency.
7. Anuvartita Sankhyaka sastram – Telugu Academy.
8. R.C.Gupta: Statistical Quality Control.
9. Parikriya Parishodhana - Telugu Academy.
10. A.M.Goon, M.K.Gupta, B.Dasgupta Fundamentals of Statistics Vol II World Press Private Ltd.,Calcutta.
11. A.M.Goon, M.K. Gupta,B. Dasgupta An outline of Statistical Theory Vol II World Press Private Ltd.,Calcutta 17.
12. D. V. L. N. Jogiraju, C. Srikala, K. Ravi Kumar Quality, Reliability and Operations Research, Kalyani Publishers.

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Code: ST522AP

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30hrs
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1 Credit

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(Examination at the end of III Semester)

(To be implemented for the students joined in 2019-20)

Semester V

Course Name: Statistical Quality Control & Reliability - Practical

Statistical Quality Control

- 1a. Construction of X-bar and R Charts.
- 1b. Construction of X-bar and R Charts using MS Excel**
- 2a. Construction of X-bar and Standard deviation Charts.
- 2b. Construction of X-bar and Standard deviation Charts using MS Excel.**
- 3a. Construction of p, np - charts with fixed and varying sample sizes.
- 3b. Construction of p, np - charts with fixed and varying sample sizes using MS Excel.**
- 4a. Construction of C - Chart.
- 4b. Construction of C - Chart using MS Excel**
- 5a. Construction of u - charts.
- 5b. Construction of u - charts using MS Excel.**

Acceptance Sampling Plans

- 6a. Designing a single sampling plan and construction of its OC and AOQ curves.
- 6b. Construction of single sampling plan - OC and AOQ curves using MS Excel.**
- 7a. Designing a double sampling plan and construction of its ASN curve
- 7b. Construction of double sampling plan -ASN curves using MS Excel**
8. Problems on Hazard rate. Series. Parallel and K out of n system.

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B.Sc. III Year (CBCS): Statistics Syllabus

(Examination at the end of VI Semester)

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Semester VI

Course Name: Applied Statistics II

Course Objectives:

This course aims to,

COB1: Demonstrate an application of one - way and two - way analysis of variance

COB2: Obtain the knowledge about application of Design of Experiments.

COB3: Procure the basis for the estimates of births and deaths used in the cohort method.

COB4: Attain a set of statistical procedures used to discover the most important real factors affecting sales and their relative influence.

UNIT - I (12)

Analysis of Variance - ANOVA

Concept of Gauss-Mark off linear model with examples, statement of Cochran's theorem, ANOVA – one-way, two-way classifications with one observation per cell. Expectation of Various sums of squares and their Statistical analysis

UNIT – II (12)

Design of Experiments

Importance and applications of design of experiments. Principles of experimentation. Analysis of Completely randomized Design (CRD), Randomized Block Design (RBD) and Latin Square Design (LSD) including one missing observation, expectation of various sum of squares. Comparison of the efficiencies of the above designs.

UNIT - III (11)

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

UNIT - IV (10)

Demand Analysis: Introduction. Demand and supply, price elasticity of supply and demand. Methods of determining demand and supply curves, Leontiff's, Pigous's methods of determining demand curve from time series data, limitations of these methods. Pareto law of income distribution, curves of concentration

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Course Outcomes:

Upon successful completion of the course, students able to:

- CO1:** *Assess ANOVA for one-way, two –way classification, fixed effect models with equal, number of observations per cell in real time problems.*
- CO2:** *Analyze and interpret the data using Design of Experiments.*
- CO3:** *Acknowledge the Vital statistics data uses—they serve as a base for public health, social service, and economic planning and program development and are used to track progress toward health goals.*
- CO4:** *Forecast the market which is of importance in the modern business activities. It helps to design the appropriate pricing policy.*

List of Reference Books:

1. V.K.Kapoor and SC.Gupta : Fundamentals of Applied Statistics. Sultan Chand and sons, New Delhi
2. Parimal Mukhopadhyay: Applied Statistics. New Central Book agency. Books and Allied(P) Limited
3. B.L.Agarwal: Basic Statistics.New Age International Limited.
4. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs. Wiley Eastern Publications.
5. M.R.Saluja : Indian Official Statistics. ISI. publications.
6. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
7. Prathirupa Sidhanthamulu – Telugu Academy.
8. Prayoga Rachana and Visleshana – Telugu Academy.
9. K.V.S. Sarma: Statistics made Simple : do it yourself on PC. PHI
10. Gerald Keller; Applied Statistics with Microsoft excel. Duxbury. Thomson Learning.
11. Levine, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel. Pearson Publication.
12. Anuvartita Sankhyaka sastram – Telugu Academy.
13. Arora, Sumeet Arora, S. Arora: Comprehensive StatisticalMethods. S.Chand.
14. A.M.Goon, M.K.Gupta, B.Dasgupta, Fundamentals of Statistics Vol II World Press private Ltd.,Calcutta

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30hrs
(2hrs/ week)
1 Credit

B.Sc. III Year (CBCS): Statistics Syllabus

(Examination at the end of III Semester)

(To be implemented for the students joined in 2019-20)

Semester VI

Course Name: Applied Statistics II– Practical

Designs of Experiments

- 1a. ANOVA of One-Way Classification.
- 1b. ANOVA of One-Way Classification using MS Excel.
- 2a. ANOVA of Two-Way Classification.
- 2b. ANOVA of Two-Way Classification using MS Excel.
- 3a. Analysis of Completely Randomized Design.
- 3b. Analysis of Completely Randomized Design using MS Excel.
- 4a. Analysis of Randomized Block Design and estimation of one missing value in RBD
- 4b. Analysis of Randomized Block Design using MS Excel.
5. Analysis of Latin Square Design and Estimation of one missing value in LSD

Vital Statistics

6. Computation of various Morality rates, Fertility rates and Reproduction rates.
- 7a. Construction of Complete life tables.
- 7b. Construction of Complete life tables using MS Excel.

Demand Analysis

8. Fitting of Pareto's Curve.
- 9a. Fitting of Lorenz curve.
- 9b. Fitting of Lorenz curve using MS Excel.

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B.Sc. III Year (CBCS): Statistics Syllabus

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(To be implemented for the students joined in 2019-20)

Semester VIA

Course Name: Operation Research

45hrs
(3hrs/ week)
3 Credits

Course Objectives:

The objective of this course is to,

COB1: impart knowledge in concepts and tools of Operations Research.

COB2: Determining the Optimum solution to the LPP by using Big –M method, Dual simplex method and its extensions to dual LPP Understand the sequence of jobs on machines and simulation.

COB3: Model formulation and applications that are used in solving Transportation problems.

COB4: Describe the theoretical workings of the solution methods for assignment problems and demonstrate their working by hand and solver.

UNIT - I

(14)

Linear Programming: Introduction to OR, Convex sets and their properties, Nature, Scope, Functions, Formulation of LPP - Solving the LPP by graphical method. Fundamental theorem of LPP (only statement). Solving the LPP by simplex method, Two - phase simplex method

UNIT – II

(10)

Big - M Method: Solution to LPP using Big – M method (Penalty Method) and Concept of degeneracy and resolving it.

Duality: Concept of duality, duality as L.P.P. Dual-Primal relationship.

Sequencing: Processing n Jobs through 2 and 3 Machines & 2 Jobs through m Machines.

UNIT - III

(11)

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

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UNIT - IV

(10)

Assignment Problem: Concept. Mathematical Formulation. Assignment problem as special case of TP and LPP Solution. Optimal solution using Hungarian method for Balanced and Unbalanced problems. Travelling Salesman Problem.

Course Outcomes:

Upon successful completion of the course, students able to:

- CO1:** Identify and express a decision problem in mathematical form and solve it graphically and by Simplex method
- CO2:** Explain the relationship between a linear program and its dual, including strong duality and complementary slackness and understand the usage of Sequencing Jobs and Simulation for Solving Business Problems
- CO3:** Recognize and formulate transportation problems and drive their optimal solution.
- CO4:** Recognize and formulate Assignment problems and drive their optimal solution.

List of Reference Books:

1. Kanti Swaroop, P.K.Gupta and ManMohan : Operations Research. Sultan Chand.
2. Operations Research – S D Sharma.
3. Taha : Operations Research : An Introduction, Mac Millan.
4. Gass: Linear Programming. Mc Graw Hill.
5. Hadly : Linrar programming. Addison-Wesley.
6. 3.Wayne L. Winston: Operations Research. Thomson, India edition. 4th edition.
7. Anuvartita Sankhyaka sastram – Telugu Academy.
8. Parikriya Parishodhana - Telugu Academy.
9. A.M.Goon,M.K.Gupta,B.Dasgupta Fundamentals of Statistics Vol II World Press Private Ltd.,Calcutta.
10. D. V. L. N. Jogiraju, C. Srikala, K. Ravi Kumar Quality, Relability and Operations Research, Kalyani Publishers.

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30hrs
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1 Credit

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Semester VI

Course Name: Operation Research – Practical

List of practicals:

- 1a. Solution of LP problem by Graphical method.
- 1b. Solution of LP problem by Graphical method using TORA.**
- 2a. Solution of LP problem by simplex method.
- 2b. Solution of LP problem by simplex method using TORA.**
- 3a. Solution of LP problem by Big-M method.
- 3b. Solution of LP problem by Big-M method using TORA.**
- 4a. Solution of LP problem by Two – phase method.
- 4b. Solution of LP problem by Two – phase method using TORA.**
5. Solution of LP problem by Duality.
- 6a. Determination of Optimum solution to TP using MODI algorithm.
- 6b. Determination of Optimum solution to TP using MODI algorithm using TORA.**
7. Determination of Optimum solution to Traveling salesman problem.
- 8a. Determination of Optimum assignment problem (Balanced and unbalanced) for all cases.
- 8b. Determination of Optimum assignment problem (Balanced and unbalanced) for all cases using TORA.**
9. Problems of n jobs on 2 Machines.
10. Problems of n jobs on 3 Machines.
11. Problems of n jobs on m Machines.

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B.Sc. II Year (CBCS): Statistics SEC Syllabus

(Examination at the end of VI Semester)

(To be implemented for the students joined in 2019-20)

Semester IV

SEC Course Name: Data Analysis Using Python- II

30hrs
(2hrs/ week)
2 Credits

Course Objectives:

This course aims to,

COB1: Understand and use hypothesis testing method to drive business decisions

COB2: Familiarize students about linear, non-linear regression models, and classification techniques for Data analysis

UNIT - I

(15)

Computing Python: Write a code and program for computing the probabilities of Bernoulli, Binomial, Poisson and Normal distribution.

Correlation and Regression Analysis: Computation of Correlation co-efficient and Simple Regression lines and forecast the future values.

UNIT – II

(15)

Testing of Hypothesis: Test for Proportion(s), Mean(s), SD (s) for Large samples, t-test for single mean, difference of means (independent and dependent samples), Chi-square test for goodness of fit, independent of attributes and single variance, F-test for difference of variances.

Course Outcomes:

Upon successful completion of the course, students able to:

CO1: *prepare data for analysis, perform simple statistical analyses, create meaningful data visualizations, predict future trends from data*

CO2: *utilize data for estimation and assessing theories, construct confidence intervals, interpret inferential results, and apply more advanced statistical modeling procedures*

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List of Reference Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705.
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython 2nd Edition, by Wes Mckinney.
3. Automate the Boring Stuff with Python: Practical Programming for Total Beginners Paperback, April 14, 2015 by Al Sweigart.
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
5. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013.
6. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
7. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

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2 Credits

B.Sc. II Year (CBCS): Statistics SEC Syllabus

(Examination at the end of VI Semester)

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Semester III

SEC Course Name: Data Analysis Using Python-I

Course Objectives:

This course aims to,

COB1: Train to Install Python and workspace setup and also learn about the various packages and functions.

COB2: Understand and use the various graphics in Python for data visualization Gain a basic understanding of the various statistical concepts

UNIT - I

(15)

Introduction to Python: Introduction, Overview and History of Python, Downloading and Installing Python, Working with Data, Program Organization and Functions, Modules and Libraries, Classes and Objects.

UNIT – II

(15)

Exploratory data analysis: Measures of Central Tendency, Measures of dispersions, Diagrams and Graphs, Box plot and Scatter plot.

Probability distributions and Simulations: Generation of Random number, Fitting of Binomial, Poisson and Normal distribution.

Course Outcomes:

Upon successful completion of the course, students able to:

CO1: Create python codes to understand how various statements are executed in Python.

CO2: Explore effectively carry out data exploration and visualization.

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List of Reference Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705.
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython 2nd Edition, by Wes Mckinney.
3. Automate the Boring Stuff with Python: Practical Programming for Total Beginners Paperback, April 14, 2015 by Al Sweigart.
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
5. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013.
6. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
7. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

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