



RANI CHANNAMMA UNIVERSITY

BELAGAVI

THE COURSE STRUCTURE & SYLLABUS OF UNDER GRADUATE

BACHELOR OF SCIENCE

STATISTICS

1ST TO 6TH Semesters

w.e.f.

**Academic Year 2020-21 and Onwards
Under**

CHOICE BASED CREDIT SYSTEM (CBCS)

CHOICE BASED CREDIT SYSTEM [CBCS]

B.Sc. Program with Statistics Optional Subject

B.Sc.: Statistics as one of the optional subject revised syllabus under CBCS (w.e.f. 2020-21 and onwards)								
Sem	Part	Paper Code	Title of Paper	Hours/ Week	Marks			Subject Credits
					IA	Exam	Total	
I	Part – 1 DSC	STSDSCT 1.1	Descriptive Statistics	4	20	80	100	3
		STSDSCP 1.1	Practicals-I	3	10	40	50	1
	Total : Hours / Credits				7			150
II	Part – 1 DSC	STSDSCT 2.1	Bivariate Data Analysis and Standard Theoretic Distributions	4	20	80	100	3
		STSDSCP 2.1	Practicals-II	3	10	40	50	1
	Total : Hours / Credits				7			150

B.Sc.: Statistics as one of the optional subject revised syllabus under CBCS (w.e.f. 2021-22 and onwards)								
Sem	Part	Paper Code	Title of Paper	Hours/ Week	Marks			Subject Credits
					IA	Exam	Total	
III	Part – 1 DSC	STSDSCT3.1	Sampling Distributions	4	20	80	100	3
		STSDSCP 3.1	Practicals-III	3	10	40	50	1
	Part – 2 SEC	STSSECT 3.2	Statistical Methods - I	2	10	40	50	2
	Total : Hours / Credits				9			200
IV	Part – 1 DSC	STSDSCT 4.1	Statistical Inference	4	20	80	100	3
		STSDSCP 4.1	Practicals-IV	3	10	40	50	1
	Part – 2 SEC	STSSECT 4.2	Statistical Methods - II	2	10	40	50	2
	Total : Hours / Credits				9			200

CHOICE BASED CREDIT SYSTEM [CBCS]

B.Sc.: Statistics as one of the optional subject revised syllabus under CBCS (w.e.f. 2022-23 and onwards)								
Sem	Part	Paper Code	Title of Paper	Hours/Week	Marks			Subject Credits
					IA	Exam	Total	
V	Part – 1 DSE	STSDSET 5.1	Inference and Statistical Quality Control	4	20	80	100	3
		STSDSEP 5.1	Practicals-V	3	10	40	50	1
		STSDSET 5.2A (Elective-I)	(i) Sampling Theory and Demography	4	20	80	100	3
		STSDSEP 5.2A (Elective-I)	Practicals	3	10	40	50	1
		STSDSET 5.2B (Elective-II)	(i) Econometrics	4	20	80	100	3
		STSDSEP 5.2B (Elective-II)	Practicals	3	10	40	50	1
	Part – 2 SEC	STSSECT 5.3	Demography	2	10	40	50	2
		Total : Hours / Credits			16			350
Note: Students have to choose either Elective-I or Elective-II								
VI	Part – 1 DSE	STSDSET 6.1	Design of Experiments	4	20	80	100	3
		STSDSEP 6.1	Practicals	3	10	40	50	1
		STSDSET 6.2A (Elective-III)	(i) Operations Research-I	4	20	80	100	3
		STSDSEP 6.2A (Elective-III)	Practicals	3	10	40	50	1
		STSDSET 6.2B (Elective-IV)	(ii) Operations Research-II	4	20	80	100	3
		STSDSEP 6.2B (Elective-IV)	Practicals	3	10	40	50	1
	Part – 2 SEC	STSSECT 6.3	Operation Research Techniques	2	10	40	50	2
		Total : Hours / Credits			17			350
Note: Students have to choose either Elective-III or Elective-IV								

B.Sc. Program with Statistics Optional Subject

(T: Theory, P: Practical, CC/EA: Co-curricular/Extension Activities

AECC: Ability Enhancement Compulsory Course, DSC: Discipline Specific Course

DSE: Discipline Specific Elective, SEC: Skill Enhancement Course)

Note: Duration of examinations is 03 Hrs for 80 Marks theory and 02 hrs for 40 marks theory. For practical's duration of examination is 03 Hrs.

B.Sc I Semester-Statistics

Paper Code: STSDSCT1.1

Teaching Hours: 4 Hrs / Week

Teaching Hours: 60Hrs

Paper Title: Descriptive Statistics

Marks: Theory-80+IA-20

Credits: 03

UNIT I

Introduction: Definition and scope of Statistics, concept of population and sample. Data - qualitative and quantitative, variables and attributes. Measurement scales - nominal, ordinal, interval and ratio. Presentation - classification & tabulation, frequency distribution. Diagrams - simple, multiple, subdivided and percentage. Graphs – histogram, frequency polygon, frequency curve, ogives.

12Hours

UNIT II

Measures of Central tendency: Purpose of measures of location, definition of A.M, G.M, H.M & their properties (with proof), median and mode. Partitioned values - quartiles, deciles and percentiles.

10Hours

UNIT III

Measures of Dispersion: Absolute and relative measures - range, quartile deviation, mean deviation, standard deviation and coefficient of variation. Moments, skewness and kurtosis.

10Hours

UNIT IV

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of probability – classical, statistical, and axiomatic. Conditional probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.

14Hours

UNIT V

Random variables & Mathematical Expectation: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations. Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables, bivariate transformations with illustrations.

14Hours

Books for Reference:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4. Gupta S.C and Kapoor V.K.: Fundamentals of Mathematical Statistics- Sultan Chand & Sons publications.
5. Hogg .R.V.and Craig.A.T(1978):Introduction to Mathematical Statistics.Amerind Publishing Company.

B.Sc I Semester- Statistics

Paper Code: STSDSCP1.1

Paper Title: PRACTICALS

Practical Hours: 3 Hrs / Week

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

1. Construction of frequency distribution and graphical representation.
2. Measures of central tendency-I Computation of AM, GM and HM
3. Measures of central tendency-II Computation of positional averages and partition values.
4. Measures of dispersion – Range, QD, MD, SD and CV.
5. Moments, skewness and kurtosis for a frequency distribution.
6. Examples on Compound probability, total probability and Baye's theorem.
7. Random variables.

B.Sc II Semester- Statistics

Paper Code: STSDSCT2.1 and Distributions	Paper Title: Bivariate Data Analysis Standard Theoretic
Teaching Hours: 4 Hrs/Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT I

Mathematical Expectation of single and bivariate random variables, its properties. Addition and multiplication theorem of expectation. Moments and Cumulants. MGF and CGF - their properties, conditional expectation, variance, covariance, mean and variance of linear combination of random variables.

12Hours

UNIT II

Bivariate data: Definition, scatter diagram, simple, Karl Pearson's correlation coefficient, Spearman's Rank correlation coefficient, Properties, concept of errors, principles of least squares, simple linear regression and its properties, fitting of regression lines, coefficient of determination.

14Hours

UNIT III

Multivariate (Trivariate) Data Analysis: Multiple linear regression, multiple and partial correlation coefficients. Residuals and their properties.

10Hours

UNIT IV

Discrete probability Distributions: Bernoulli, Binomial, Poisson, Negative Binomial, Geometric and Uniform, distributions - definition, mean, variance and m.g.f., c.g.f and moments upto fourth order only. Hyper geometric distribution: definition, mean and variance. Recurrence relation for probabilities and moments of Binomial and Poisson distributions. Approximations of binomial, negative binomial and hyper geometric distributions.

14Hours

UNIT V

Continuous Probability Distributions: Uniform, Gamma, Beta, Exponential, Normal and Cauchy distributions - Mean, variance, moments, MGF and Properties.

10Hours

Books for reference:

1. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi.
4. Gupta S.C and Kapoor V.K.: Fundamentals of Mathematical Statistics- Sultan Chand & Sons

B.Sc II Semester- Statistics

Paper Code: STSDSCP2.1

Paper Title: PRACTICALS

Practical Hours: 3 Hrs / Week

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

1. Bivariate distributions: Computation of marginal and conditional distributions.
2. Correlation: Computation of Karl Pearson's correlation coefficient, Rank correlation coefficient.
3. Fitting of regression equations.
4. Partial and multiple correlation.
5. Fitting of Poisson distributions.
6. Fitting of Binomial distributions.
7. Fitting of normal distribution.

B.Sc III Semester- Statistics

Paper Code: STSDSCT3.1

Paper Title: Sampling Distributions

Teaching Hours: 4 Hrs / Week

Marks: Theory-80+IA-20

Teaching Hours: 60Hrs

Credits: 03

UNIT I

Limit Theorems: Chebyshev's inequality its role in approximating probabilities. Convergence of binomial, Poisson and Gamma distributions to Normal distribution. Statement of central theorems and its applications. **10Hours**

UNIT II

Order Statistics: Introduction, distribution of the r th order statistic, smallest and largest order statistics. Joint distribution of r th and s th order statistics, distribution of sample median and sample range. **08Hours**

UNIT III

Definitions of random sample, parameter and statistic, sampling distribution of a statistic, sampling distribution of sample mean, standard errors of sample mean, sample variance and sample proportion. Null and alternative hypotheses, level of significance, Type I and Type II errors, their probabilities and critical region. Large sample tests, for testing single proportion, difference of two proportions, single mean, difference of two means, standard deviation and difference of standard deviations. **14Hours**

UNIT IV

Exact sampling distribution-I: Definition and derivation of p.d.f. of χ^2 with n degrees of freedom (d.f.) using m.g.f., nature of p.d.f. curve for different degrees of freedom, mean, variance, m.g.f., cumulant generating function, mode, additive property and limiting form of χ^2 distribution. **14Hours**

UNIT V

Exact sampling distributions-II: Student's and t -distribution. Derivation of its p.d.f., nature of probability curve with different degrees of freedom, mean, variance, moments and limiting form of t distribution. Snedecore's F-distribution: Derivation of p.d.f., nature of p.d.f. curve with different degrees of freedom, mean, variance and mode. Distribution of $1/F(n_1, n_2)$. Relationship between t , F and χ^2 distributions. Test of significance and confidence Intervals based on t and F distributions. **12Hours**

Books for Reference:

1. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi.
4. Gupta S.C and Kapoor V.K.: Fundamentals of Mathematical Statistics- Sultan Chand & Sons

B.Sc III Semester- Statistics

Paper Code: STSDSCP3.1

Paper Title: PRACTICALS

Practical Hours: 3 Hrs / Week

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

1. Test for mean, equality of means when variance is known and unknown under normality (small and large samples)
2. Test for single proportion and difference of proportions.
3. Test for variance and equality of two variances under normality.
4. Application of Chi-square distribution-I
5. Application of Chi-square distribution-II
6. Application of t - distribution
7. Application of F – distribution

B.Sc III Semester- Statistics

Paper Code: STSSEC3.2	Paper Title: Statistical Methods - I
Teaching Hours: 2 Hrs / Week	Marks: Theory-40+IA-10
Teaching Hours: 30Hrs	Credits: 01

Statistical Techniques provide scientific approaches to develop the domain of human knowledge largely through empirical studies. The course aims at enabling students understand basic concepts and aspects related to research, data collection, analyses and interpretation.

UNIT I

Introduction: Meaning, objection and motivation in research, types of research, research approach, significance of research. Research problems: definition, selection and necessity of research problems. **08Hours**

UNIT II

Survey Methodology and Data Collection, inference and error in surveys, the target populations, sampling frames and coverage error, methods of data collection, non-response, questions and answers in surveys. **08Hours**

UNIT III

Processing, Data Analysis and Interpretation: Review of various techniques for data analysis covered in core statistics papers, techniques of interpretation, precaution in interpretation. Develop a questionnaire, collect survey data pertaining to a research problem (such as gender discriminations in private v/s government sector, unemployment rates, removal of subsidy, impact on service class v/s unorganized sectors), interpret the results and draw inferences. **14Hours**

Books for Reference :

1. Kothari, C.R. (2009): Research Methodology: Methods and Techniques, 2nd Revised Edition reprint, New Age International Publishers.
2. Kumar, R (2011): Research Methodology: A Step - by - Step Guide for Beginners, SAGE publications.

B.Sc IV Semester- Statistics

Paper Code: STSDSCT4.1

Paper Title: Statistical Inference

Teaching Hours: 4 Hrs / Week

Marks: Theory-80+IA-20

Teaching Hours: 60Hrs

Credits: 03

UNIT I

Estimation: Concepts of estimation, unbiasedness, sufficiency, consistency and efficiency. Factorization theorem. Complete statistic, Minimum variance unbiased estimator (MVUE), Cramer-Rao inequality and MVB estimators(statement and applications).

12 Hours

UNIT II

Methods of Estimation: Maximum likelihood and Method of moments standard examples. Illustration for non uniqueness of MLE's. Properties of MLE and MME. Examples on MLE

12 Hours

UNIT III

Interval Estimation: Meaning of confidence interval, confidence coefficient, confidence interval for mean difference between means for small and large samples. Confidence interval for proportion and difference between two proportions for large samples.

12 Hours

UNIT IV

Testing of statistical hypothesis: Null and alternative hypotheses (simple and composite) Type-I and Type-II errors, critical region, level of significance, size and power, best critical region, most powerful test, uniformly most powerful test, Neyman Pearson Lemma (statement and applications to construct most powerful test). Likelihood ratio test, properties of likelihood ratio tests (without proof).

12 Hours

UNIT V

Sequential Testing: Need for sequential tests. Wald's SPRT, Graphical procedure of SPRT. Determination of stopping bounds. Construction of SPRT for Binomial, Poisson, Normal distributions. Approximate expressions for OC and ASN functions for Binomial, Poisson and Normal distributions.

12 Hours

Books for Reference:

1. Goon A.M., Gupta M.K.: Das Gupta.B. (2005), Fundamentals of Statistics, Vol.I, World Press, Calcutta.
2. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics.
2ndEdn. (Reprint) John Wiley and Sons.
3. Miller, I. and Miller, M. (2002) : John E. Freund's Mathematical Statistics (6th addition, low price edition), Prentice Hall of India.
4. Dudewicz, E. J., and Mishra, S. N. (1988): Modern Mathematical Statistics. John Wiley & Sons.
5. Mood A.M, Graybill F.A. and Boes D.C,: Introduction to the Theory of Statistics, McGraw Hill.
6. Bhat B.R, Srivenkatramana T and RaoMadhava K.S. (1997) Statistics: A Beginner's Text, Vol.
New Age International (P) Ltd.
7. Snedecor G.W and Cochran W.G.(1967) Statistical Methods. Iowa State University Press.
8. Gupta S.C and Kapoor V.K.: Fundamentals of Mathematical Statistics- Sultan Chand & Sons

B.Sc IV Semester- Statistics

Paper Code: STSDSCP4.1

Paper Title: PRACTICALS

Practical Hours: 3 Hrs / Week

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

1. Unbiased estimators (including unbiased but absurd estimators)
2. Consistent estimators, efficient estimators and relative efficiency of estimators.
3. Cramer-Rao inequality and MVB estimators
4. Estimation of parameters: MLE-I
5. Estimation of parameters: MLE-II
6. Estimation of parameters: Method of moments.
7. Confidence interval
8. SPRT - I
9. SPRT –II

B.Sc IV Semester- Statistics

Paper Code: STSSEC4.2

Paper Title: Statistical Methods - II

Teaching Hours: 2 Hrs / Week

Marks: Theory-80+IA-20

Teaching Hours: 30Hrs

Credits: 01

UNIT- I

Index Numbers: Meaning and definition, types- Price, quantity and Value index. Uses and limitations of index numbers, construction of Index numbers, methods of Index numbers– Un-weighted and weighted prices and quantities. Test for Index numbers- TRT and FRT. Consumer price Index Numbers. **08 Hours**

UNIT- II

Time Series: Meaning and definition of Time series , Uses , components of time series. Measurement of Time series – Graphic, semi- avg , moving averages (3,4 and 5 yearly),methods of least square(Straight line and Quadratic) **08 Hours**

UNIT- III

Correlation and Regression: Definition simple correlation, types- positive, negative and Zero correlation. Methods of measurement - scatter diagram, Karl Pearson's correlation coefficient, Spearman's Rank correlation coefficient, Properties, coefficient of determination. Meaning and definition of linear regression, regression equations – X on Y and Y on X and its properties, fitting of regression equations and lines. **14 Hours**

Reference Books:

1. Goon A.M., Gupta M.K.: Das Gupta.B. (2005), Fundamentals of Statistics, Vol.I, World Press, Calcutta.
2. Mukhopadhyaya P. (2005) , Applied statistics, New Central Book agency, Calcutta.
3. Gupta S.C and Kapoor V.K.: Statistical methods - Sultan Chand & Sons Publications Delhi.

List of Assignments:

1. Computation of Price and quantity index numbers.
2. Test for Index Numbers and Cost of living Index numbers.
3. Computation of moving averages – 3, 4, and 5 years
4. Fitting of straight line and quadratic equations.
5. Computation of coefficient of Correlation.
6. Fitting of linear regression equations.

B.Sc V Semester- Statistics

Paper Code: STSDSET5.1

Paper Title: Inference and Statistical Quality

Control

Teaching Hours: 4 Hrs / Week

Marks: Theory-80+IA-20

Teaching Hours: 60Hrs

Credits: 03

UNIT I

Non parametric tests: Run test for randomness, Sign test and Wilcoxon signed rank test for one and paired samples. Run test, Median test and Mann-Whitney-Wilcoxon test for two sample problems. Test for independence based on Spearman's Rank correlation coefficient. **12Hours**

UNIT II

Index Numbers : Meaning and definition, types- Price, quantity and Value index. Uses and limitations of index numbers, construction of Index numbers, methods of Index numbers– Un-weighted and weighted prices and quantities. Test for Index numbers- TRT and FRT. Consumer price Index Numbers. **12Hours**

UNIT III

Time Series: Meaning and definition of time series, uses, components of time series. Measurement of time series– graphical, semi averages, moving averages (3, 4 and 5 yearly) and method of least squares (straight line, quadratic and exponential) **12Hours**

UNIT IV

Statistical Quality Control: Meaning and definition of quality, quality assurance and management. Aims and objectives of statistical process control, chance and assignable causes of variation. $3\text{-}\sigma$ limits warning limits and probability limits. **12Hours**

UNIT V

Control charts for variables and Attributes: Construction of Control charts for variables \bar{X} and R charts; charts for attributes P-chart, np-chart, c-chart and U-chart and their interpretations'; Acceptance sampling plan – single and double sampling. **12Hours**

Books for Reference:

1. S.P.Gupta and V. K Kapoor: Fundamentals of Mathematical Statistics; Sultan Chand & Co.
2. S.P.Gupta and V. K Kapoor: Fundamentals of Applied Statistics; Sultan Chand & Co.
3. Grant,E.L. and Leaven worth,R.S(1988):Statistical Quality Control,6th edition,McGrawHill
4. Gupta R.C.: Statistical Quality Control, - KhannaPub.Co.
5. Montgomery, C.D. (1999): Introduction to Statistical Quality Control, Wiley Int.Edn.
6. Goon A.M., Gupta M.K.: Das Gupta.B. (2005), Fundamentals of Statistics, Vol.I, World Press, Calcutta.
7. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics 2nd Edn. (Reprint) John Wiley and Sons.

B.Sc V Semester- Statistics

Paper Code: STSDSEP5.1	Paper Title: PRACTICALS
Practical Hours: 3 Hrs / Week	Marks: Practical-40+IA-10
	Credits: 01

List of Practicals

1. Non parametric tests - I
2. Non parametric tests – II
3. Index Number
4. Times Series
5. Construction of \bar{X} and R charts.
6. Construction of P and np charts.
7. Construction of C and U - charts.

Books for reference:

1. S.P.Gupta and V. K Kapoor: Fundamentals of Mathematical Statistics; Sultan Chand & Co.
2. S.P.Gupta and V. K Kapoor: Fundamentals of Applied Statistics; Sultan Chand & Co.
3. Grant, E.L. and Leavenworth, R.S (1988): Statistical Quality Control, 6th edition, McGrawHill
4. Gupta R.C.: Statistical Quality Control, - KhannaPub.Co.
5. Montgomery, C.D. (1999): Introduction to Statistical Quality Control, Wiley Int.Edn.
6. Goon A.M., Gupta M.K.: Das Gupta.B. (2005), Fundamentals of Statistics, Vol.I, World Press, Calcutta.
7. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2ndEdn. (Reprint) John Wiley and Sons.

B.Sc V Semester- Statistics

Paper Code: STSDSET5.2A	
Paper Title: (i) Sampling Theory and Demography	Elective-I
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT I

Introduction: Concepts of population and sample. Need for sampling. Complete enumeration vs Sample surveys. Non probability and probability sampling; meaning, need and illustrations . Use of random numbers .Principal steps in a sample survey. Requisites of a good questionnaire. Pilot surveys. Sampling and non sampling errors.

10 Hours

UNIT II

Simple Random Sampling: Sampling with and without replacement. Unbiased estimators of population mean and total. Derivation of sampling variance .Standard errors of the estimators.Derivations of variances of the estimators and their estimation .Determination of sample size.Formulas for sample size in sampling for proportions and means.

12 Hours

UNIT III

Stratified Random Sampling: Need for stratification unbiased estimator of mean and total in stratified random sampling. Derivation of the SE's and their estimation.Allocation of sample size under proportional, Optimum and Neyman allocation. Comparison of $V(ran)$, $V(prop)$ and $V(opt)$ ignoring $f p c$. Estimation of gain in precision due to stratification.

12 Hours

UNIT IV

Systematic Random Sampling: Unbiased estimator of population mean and its variance.Expression of variance with intra class correlation.Systematic sampling with linear trend. Comparison of systematic sampling with simple and stratified random sampling procedure.

12 Hours

UNIT V

Demography and life tables: Sources of demographic data.Measurement of Mortality: Crude, Specific and Standardized death rate, Infant mortality rate, Neonatal mortality rate and maternal mortality rates. Fecundity and fertility. Measurement of fertility: Crude, Age specific, General and Total fertility rates Reproduction rates-NRR and GRR. Life table: Definition and uses, components of life table- Explanation of the columns of life table. Abridged life table - King's method.

14 Hours

Books for Reference:

1. Das M.N.: Sampling Theory and Methods-Statistical society, ISI, Kolkata.
2. Des Raj and Chandak; Sampling Theory-Narosa,New Delhi.
3. Sukhatme P.V.et.al: Sampling Theory of surveys with applications-Indian Society of Agricultural Statistics,New Delhi.

B.Sc V Semester- Statistics

Paper Code: STSDSEP5.2A Elective-I

Paper Title: PRACTICALS

Practical Hours: 3 Hrs / Week

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

1. Simple Random Sampling
2. Stratified Random Sampling
3. Systematic Sampling
4. Demography –I: Measurement of mortality, infant mortality, standardized death rates.
5. Demography- II: Measurement of fertility, ASFR, TFR and reproduction rates.
6. Demography- III: Construction of life-tables.

Books for reference:

1. Cochran.W.G.Sampling Techniques (3rd Ed)-Wiley Eastern.
2. Singh and Chaudhary,F.S. (1986): Theory and Analysis of Sample survey design (Wiley Eastern).
3. Goon A.M et.al: Fundamentals of Statistics, Vol. II- World Press, Calcutta.
4. Gupta S.C and Kapoor V.K.: Fundamentals of Applied Statistics- Sultan Chand & Sons Pub.
5. Srivastava .O.S (1983); A Text book of Demography-Vikas Publishing.
6. Cox.P.R(1970);Demography,Cambridge University Press.

B.Sc V Semester- Statistics

Paper Code: STSDSET5.2B Elective-II	Paper Title: (i) Econometrics
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT I

Introduction: Objective behind building econometric models, nature of econometrics, model building, role of econometrics, structural and reduced forms. General linear model (GLM). Estimation under linear restrictions. **12Hours**

UNIT II

Multicollinearity: Introduction and concepts, detection of multicollinearity, consequences, tests and solutions of multicollinearity, specification error. **12Hours**

UNIT III

Generalized least squares estimation, Aitken estimators. Autocorrelation: concept, consequences of autocorrelated disturbances, detection and solution of autocorrelation. **12Hours**

UNIT IV

Heteroscedastic disturbances: Concepts and efficiency of Aitken estimator with OLS estimator under heteroscedasticity. Consequences of heteroscedasticity. Tests and solutions of heteroscedasticity. Autoregressive and Lag models, Dummy variables, Qualitative data. **12Hours**

UNIT V

Gauss-Markov set up: Theory of linear equation, estimability of linear parametric function, method of least square, Gauss markov theorem, estimation of error variance. **12Hours**

Books for Reference:

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.

B.Sc V Semester- Statistics

Paper Code: STSDSEP5.2B
Elective-II

Practical Hours: 3 Hrs / Week

Paper Title: PRACTICALS

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

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

B.Sc V Semester- Statistics

Paper Code: STSSEC-3	Paper Title: Demography
Teaching Hours: 2 Hrs / Week	Marks: Theory-40+IA-10
Teaching Hours: 30Hrs	Credits: 01

UNIT- I

C.S.O : Statistical organization at Center, N.S.S.O and C.S.O - historical back ground, functions and publications. Brief study on Indian population census of 1991, 2001 and 2011 year (central and state). **10 Hours**

UNIT- II

Vital statistics – I : Meaning and definition of Vital statistics ,Sources of Vital statistics, uses and measurement of population. Measurement of Mortality: Crude, Specific and Standardized death rate, Infant mortality rate, Neonatal mortality rate and maternal mortality rates. **10 Hours**

UNIT-III

Vital statistics – II: Measurement of fertility: Crude, Age specific, General and Total fertility rates. Reproduction rates- N.R.R and G.R.R. Life table: Definition and uses, components of life table- Explanation of the columns of life table. **10 Hours**

SUGGESTED READING:

1. Moore, D.S. and McCabe, G.P. and Craig, B.A. (2014): Introduction to the Practice of Statistics,
W.H. Freeman
2. Cunningham, B.J (2012):Using SPSS: An Interactive Hands-on approach
3. Cho, M,J., Martinez, W.L. (2014) Statistics in MATLAB: A Primer, Chapman andHall/CRC

B.Sc VI Semester- Statistics

Paper Code: STSDSET6.1

Teaching Hours: 4 Hrs / Week

Teaching Hours: 60Hrs

Paper Title: Design of Experiments

Marks: Theory-80+IA-20

Credits: 03

UNIT-I

Analysis of Variance: Meaning and assumptions. Analysis of variance (fixed effects model) - Analysis of one-way, two-way classified data, expectation of mean sum of squares, ANOVA tables. Least significant difference. Case of multiple but equal number of observations per cell in two-way classification (with interaction). 3 – way classification.

14 Hours

UNIT-II

Design of Experiments: Principles of design of experiments. Completely randomized (CRD), Randomized block (RBD) and Latin square designs (LSD)- layout and formation and the analysis using fixed effect models. Comparison of efficiencies of CRD, RBD

12 Hours

UNIT-III

Latin Square Design : Layout of LSD and analysis. Estimation of missing observation in RBD, LSD and Relative efficiency.

12 Hours

UNIT-IV

Factorial Experiments: 2^2 -- factorials. Main effects and interactions, their best estimates and orthogonal contrasts. Yates methods of computing factorial effects .Total, partial confounding in a 2^3 -- experiments with RDB layout.

12 Hours

UNIT-V

Spilt-Plot design: Introduction, Definition and examples of Split-Plot design. Analysis of Split-Plot design and complete ANOVA table for a split- plot design.

10 Hour

Books for Reference:

1. Cochran.W.G. andG.M.Cox: Experimental Designs-John Wiley.
2. Goon A.M et.al: Fundamentals of Statistics, Vol. II- World Press, Calcutta.
3. Gupta S.C and VK Kapoor: Fundamentals of Applied Statistics- Sultan Chand & Sons.
4. Montgomery.D.C: Design and analysis of experiments: Wiley
5. Das M.N. and Giri.N: Design of Experiments: Theory and Applications.
6. Joshi.D.D.Linear estimation and Design of Experiments: New-Age International.

B.Sc VI Semester- Statistics

Paper Code: STSDSEP6.1

Paper Title: PRACTICALS

Practical Hours: 3 Hrs / Week

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

1. ANOVA - I
2. ANOVA - II
3. CRD
4. RBD
5. LSD
6. Estimation of missing value in RBD & LSD and Analysis
7. Factorial Designs 2^2 and 2^3

B.Sc VI Semester- Statistics

Paper Code: STSDSET6.2A Elective-I	Paper Title: (i) Operations Research-I
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

Unit: 1.

Linear Programming Problem (LPP): Definition and Scope of Operations Research (OR). Definition, Basic Concepts and Formulation of an LPP. Mathematical form of general LPP, Standard LPP, Slack, Surplus and artificial variables, Feasible solution, Basic feasible solution, Optimum solution. Graphical solution. Simplex algorithm Big-M Method and Examples. **15 Hours**

Unit:2.

Transportation problem: Definition and mathematical form of TP, feasible solution, basic feasible solution, Optimum solution. Methods of finding BFS: Northwest corner rule, matrix minima method, and Unit cost penalty method (Vogel's approximation method). Method of finding optimum solution to a TP, Unbalanced TP. Simple problems. **10 Hours**

Unit: 3.

Assignment problem: Definition and mathematical form of assignment problem, procedure of solving assignment problem. Simple problems. The travelling salesman problem.

Sequencing Problems: Introduction: Definition, Terminology and assumptions. Problems through n jobs through 2 machines. Processing n jobs through 3 machines. **15 Hours**

Unit: 4.

Game Theory: Rectangle game, minimax-maximin principle, solution to rectangular game using graphical method, dominance and modified dominance property to reduce the game matrix. **10 Hours**

Unit: 5.

Inventory theory: Description of Inventory system. Inventory costs. Demand lead time. EOQ model with and without shortages. EOQ model with finite replenishment. Probabilistic demand. News paper boy problem. **10 Hours**

Books for Reference:

1. Kantiswaroop, Man Mohan and P.K Gupta (2003): Operations Research-Sultan Chand & Co.
2. Churchman C.W, Ackoff R.L and Arnoff E.L (1957): Introduction to Operations Research-John Wiley.
3. Shenoy,G.V.,Srivatsava,U.K and Sharma,S.C.: Operations Research for Management,New Age International.
4. S. Kalavathy Operations Research Methods and Practice- New age Publication
5. Mittal K.V: Optimization Method- New age Publication
6. Kapoor V.K: Operations Research- Sultan Chand & Co.
7. Narag,A.S..Linear Programming and Decision making. - Sultan Chand & Co.

B.Sc VI Semester- Statistics

Paper Code: STSDSEP6.2A Elective-I	Paper Title: PRACTICALS
Practical Hours: 3 Hrs / Week	Marks: Practical-40+IA-10
	Credits: 01

List of Practicals

1. Linear Programming Problem-I: Formulation of LPP.
2. Linear Programming Problem –II: Graphical method for solving LPP
3. Linear Programming Problem-III: Simplex and Big-M methods to solve LPP.
4. Transportation problem
5. Assignment problem
6. Game Theory
7. Inventory theory- I
8. Inventory theory –II

B.Sc VI Semester- Statistics

Paper Code: STSDSET6.2B Elective-II	Paper Title: (ii) Operations Research-II
Teaching Hours: 4 Hrs / Week	Marks: Theory-80+IA-20
Teaching Hours: 60Hrs	Credits: 03

UNIT I

Queuing Theory : Basics concept of queue, characteristic, steady state system, size distribution in M/M/1 queue system(only statement), waiting time distribution, little's formula, measure of effectiveness, derivations of expressions for expected queue length, size, waiting time, description of M/M/C queuing system **14Hours**

UNIT II

Simulation: Types of Simulation.Random variable. Monte - Carlo technique and generation of random numbers. **08Hours**

UNIT III

Decision Theory: Introduction, basic terminology, steps in decision making. Decision making environment - Decision under conditions of uncertainty – maximax criterion, maximin criterion, Laplace criterion, Regret criterion and Hurwicz criterion.Decisions making under conditions of risk – EMV, EVPI and EOL.Decision tree analysis. **14Hours**

UNIT IV

PERT/CPM: Introduction, basic terms, common errors.Rules of Net work construction. Fulkerson's Rule, construction of Network.Time analysis and Critical Path Method. **12Hours**

UNIT V

Inventory theory: Description of Inventory system. Inventory costs. Demand lead time. EOQ model with and without shortages. EOQ model with finite replenishment. Probabilistic demand. News paper boy problem. **12Hours**

Books for reference:

1. Taha, H. A. (2007): Operations Research: An Introduction, 8th Edition, PrenticeHall of India.
2. KantiSwarup, Gupta, P.K. and Manmohan (2007): Operations Research, 13th Edition,Sultan Chand and Sons.
3. Hadley, G: (2002) : Linear Programming, Narosa Publications
4. Hillier, F.A and Lieberman, G.J. (2010): Introduction to Operations Research-Concepts and cases, 9th Edition, Tata McGraw Hill

B.Sc VI Semester- Statistics

Paper Code: STSDSEP6.2B

Elective-II

Practical Hours: 3 Hrs / Week

Paper Title: PRACTICALS

Marks: Practical-40+IA-10

Credits: 01

List of Practicals

1. Sequencing Problems.
2. Simulation.
3. Decision Theory – I
4. Decision Theory – II
5. PERT/CPM – I
5. PERT/CPM – II

B.Sc VI Semester- Statistics

Paper Code: STSSECT5.3	Paper Title: Operation Research Techniques
Teaching Hours: 2 Hrs / Week	Marks: Theory-40+IA-10
Teaching Hours: 30Hrs	Credits: 01

UNIT-I.

Linear Programming Problem (LPP): Definition and Scope of Operations Research (OR). Definition, Basic Concepts and Formulation of an LPP. Mathematical form of general LPP, Standard LPP, Slack, Surplus and artificial variables, Feasible solution, Basic feasible solution, Optimum solution. Graphical solution. Simplex algorithm. **10 Hours**

UNIT-II

Transportation problem: Definition and mathematical form of TP, feasible solution, basic feasible solution, Optimum solution. Methods of finding BFS: North - west corner rule, matrix minima method, and Unit cost penalty method (Vogel's approximation method).simple problems. **10 Hours**

UNIT-III

Assignment problem: Definition and mathematical form of assignment problem, procedure of solving assignment problem. Simple problems. The travelling salesman problem. **10 Hours**

List of Assignments :

1. Linear Programming Problem-I: Formulation of LPP.
2. Linear Programming Problem –II: Graphical method for solving LPP
3. Linear Programming Problem-III: Simplex
4. Transportation problem – I
5. Transportation problem - II
5. Assignment problem

Books for References :

1. Kanti swaroop, Man Mohan and P.K Gupta (2003): Operations Research-Sultan Chand & Co.
2. Churchman C.W, Ackoff R.L and Arnoff E.L (1957): Introduction to Operations Research-John Wiley.
3. Shenoy,G.V.,Srivatsava,U.K and Sharma,S.C.: Operations Research for Management, New Age Int.
4. Operations Research: S. Kalavathy Himalaya Publication