

Course Structure for Choice Based Credit System in B.A./B.Sc.(Statistics Honours)

Semester	CORE COURSE (14)	Ability Enhancement Compulsory Course(AECC) (2)	Skill Enhancement Course(SEC) (2)	Elective: Discipline Specific DSE (4)	Elective: Generic (GE) (2)
I	C-1(ST-1.1) Mathematical Methods-I & Basics of Computer	(English Communication/ MIL)/ Environmental Science			GE-I(ST-1.1) Statistical Methods-I
	C-2(ST-1.2) Statistical Methods-I				
II	C-3(ST-2.1) Mathematical Methods-II & Numerical Analysis	(English Communication/ MIL)/ Environmental Science			GE-2(ST-2.1) Probability and Probability Distributions
	C-4(ST-2.2) Probability-I				
III	C-5(ST-3.1) Probability-II		SEC-1		GE-3(ST-3.1) Sample Surveys and Time Series Analysis
	C-6(ST-3.2) Statistical Methods-II				
	C-7(ST-3.3) Statistical Inference-I				
IV	C-8(ST-4.1) Statistical Inference-II		SEC-2		GE-4(ST-4.1) Design & Analysis of Experiments & Vital Statistics
	C-9(ST-4.2) Sampling Theory				
	C-10(ST-4.3) Time Series & Index Numbers				
V	C-11(ST-5.1) Operations Research			DSE-1(ST-5.1) Statistical Methods-I	
	C-12(ST-5.2) Vital Statistics & Official Statistics			DSE-2(ST-5.2) Probability & Probability Distributions	
VI	C-13(ST-6.1) Design and Analysis of Experiments & Statistical Quality Control			DSE-3(ST-6.1) Statistical Methods-II	
	C-14(ST-6.2) Computer Applications for Statistical Problems			DSE-4 Project Report	

Course Structure for Choice Based Credit System in B.Sc.(Statistics Pass)

Semester	CORE COURSE (12)	Ability Enhancement Compulsory Course(AECC)(2)	Skill Enhancement Course(SEC)(2)	Discipline Specific Elective DSE (6)
I	DSC-(ST-A) Statistical Methods-I	(English/MIL Communication)/ Environmental Science		
	DSC-2 A			
	DSC-3 A			
II	DSC- (ST-B) Probability & Probability Distributions	Environmental Science/ (English/MIL Communication)		
	DSC-2 B			
	DSC-3 B			
III	DSC-(ST-C) Statistical Methods-II & Sampling		SEC-1	
	DSC-2 C			
	DSC-3 C			
IV	DSC-(ST- D) Design and Analysis of Experiment , Operations Research & Time Series		SEC-2	
	DSC-2 D			
	DSC-3 D			
V			SEC-3	DSE-(ST-A) Statistical Methods
				DSE-2 A
				DSE-3 A
VI			SEC-4	DSE- (ST-B) Probability & Probability Distributions
				DSE-2 B
				DSE-3 B

Course Structure for Choice Based Credit System in B.A.(Statistics Pass)

Semester	CORE COURSE (12)	Ability Enhancement Compulsory Course(AECC)(2)	Skill Enhancement Course(SEC)(2)	Elective: Discipline Specific DSE (4)	Generic Elective GE (2)
I	English/MIL-1	(English/MIL Communication)/ Environmental Science			
	DSC- (ST-A) Statistical Methods-I				
	DSC-2 A				
II	MIL/English-1	Environmental Science/ (English/MIL Communication)			
	DSC (ST-B) Probability & Probability Distributions				
	DSC-2 B				
III	English/MIL-2		SEC-1		
	DSC-(ST-C) Statistical Methods-II & Sampling				
	DSC-2 C				
IV	MIL/English-2		SEC-2		
	DSC-(ST-D) Design and Analysis of Experiment , Operation Research & Time Series				
	DSC-2 D				
V			SEC-3	DSE- (ST-A) Statistical Methods DSE-2 A	GE-1 (ST-5.1) Statistical Methods
VI			SEC-4	DSE- (ST-B) Probability & Probability Distributions DSE-2 B	GE-1 (ST-6.1) Probability & Probability Distributions

B.A./B.Sc. (STATISTICS HONOURS)

FIRST SEMESTER

C-1 (ST-1.1)

MATHEMATICAL METHODS-I *Marks-100* & *6 Credits* **BASICS OF COMPUTER**

UNIT-I

Permutation & Combination, Binomial Theorem, Logarithmic & Exponential Series, Determinant.

UNIT-II

Matrices: types of matrices(orthogonal matrix and idempotent matrix); operation on matrices (including inverse); partitioned matrices; singular and non-singular matrices.

UNIT-III

Rank of a matrix: row-rank and column-rank; properties of rank; rank of sum and product of matrices. Linear equations: homogeneous and non-homogeneous equations. Solution space: consistency and general solution.

UNIT-IV

Introduction of world of computer, The system unit: Processing & Memory- System Unit, CPU, Storage- Storage Systems: Magnetic and Optical Disks, Input and Output, Key board, Pointing Devices, Scanners, Audio Inputs & Output, Display Devices. Operating Systems: Desktop, PC, Servers and Other Devices.

UNIT-V

Application Software: Concept of Word Processing, Use of MS-Word, Basics of Word Processing, Printing of Documents, MS-EXCEL & MS-Power point.
Internet: WWW & Web Browsers, Search Engines & Email. Computer Virus.

BOOKS RECOMMENDED :

1. Intermediate Algebra by Ghanshyam Samal, Vidyapuri Publication,2007.
2. A text book of matrices by Shanti Narayan, S. Chand,1962.
- 3.Fundamentals of Computers by Morles & Parker,Cengage publication,2013.
4. Computer Fundamentals and office by Sanjay Saxena and Rajneesh Agrawal, Vikas Publication,2014.

B.A./B.Sc. (STATISTICS HONOURS)

FIRST SEMESTER

C-2 (ST-1.2)

STATISTICAL METHODS-I Marks-100

6 Credits

UNIT-I

Ideas about types of data, collection, classification and tabulation of data. Frequency distributions, graphic and diagrammatic representation of data.

UNIT-II

Analysis of Quantitative Data: Concepts of central tendency, dispersion and relative dispersion; moments, skewness and kurtosis and their measures including those based on quantiles and moments.

UNIT-III

Bivariate Data : Scatter diagram, curve fitting by the method of least squares (linear and quadratic), fitting of curves reducible to polynomials by log and inverse transformation.

UNIT-IV

Correlation Coefficient: Product moment correlation coefficient and its properties, coefficient of determination, correlation ratio, rank correlation, intraclass correlation.

UNIT-V

Regression Analysis: Concept of regression, fitting of regression lines, regression coefficients and their properties.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
3. Statistical Methods by P.N. Arora, S. Arora & S. Arora, S. Chand, 2014.

B.A./B.Sc. (STATISTICS HONOURS)

SECOND SEMESTER

C-3 (ST-2.1)

MATHEMATICAL METHODS-II *Marks-100*

&

6 Credits

NUMERICAL ANALYSIS

UNIT-I

Function of one variable; limit, continuity and differentiability; successive differentiation; mean value theorem (statement only); maxima and minima.

Function of Several Variables: Partial derivatives, transformations and Jacobians.

UNIT-II

Integration: Methods of integration: integration by parts.

UNIT-III

Sequence and series of real numbers: limits of sequence and convergence of infinite series.

UNIT-IV

Difference table. Methods of interpolation: Newton's forward and backward interpolation formulae. Newton's divided difference formula, Lagrange's interpolation formulae, inverse interpolation.

UNIT-V

Numerical differentiation and integration: Trapezoidal, Simpson's one-third, three-eighth rules.

BOOKS RECOMMENDED :

1. Differential calculus by Das & Mukherjee, U.N Dhar Publication, Kolkatta, 2010.
2. Integral Calculus by Das & Mukherjee, U.N Dhar, Kolkatta, 2010.
3. Numerical Methods by P.Kandasamy, K. Thilagavathy & K.Gunavathi, S. Chand, 2012.
4. Numerical Methods & Applications by E. Ward Cheney & David R. Kincaid, Cengage Publication, 2010.
5. Numerical Analysis by Goel and Mittal, Pragati Prakashan, ND, 2008.

B.A./B.Sc. (STATISTICS HONOURS)

SECOND SEMESTER

C-4 (ST-2.2)

PROBABILITY-I

Marks-100

6 Credits

UNIT-I

Random experiment : trials, sample point and samples space, event, operations of events, concepts of mutually exclusive and exhaustive events.

Definition of Probability : Classical, relative frequency and axiomatic approach; discrete and continuous probability space, addition law of probability.

UNIT-II

Multiplication law of probability, conditional probability and independence of events, Bayes' theorem and its applications.

UNIT-III

Random variables: Definition, properties, probability mass function, probability density function; distribution function, joint, marginal and conditional distributions.

UNIT-IV

Mathematical expectation of a random variable and its properties, moment generating function, cumulant generating function and probability generating function.

UNIT-V

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson, Negative Binomial, Geometric.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Mathematical Statistics by J.N. Kapoor & H.C. Saxena, S. Chand, 2011.
3. An Outline of Statistical Theory, Vol-I, Gun, Gupta & Dasgupta, 4th Edn., World Press, 2003.

B.A./B.Sc. (STATISTICS HONOURS)

THIRD SEMESTER

C-5 (ST-3.1)

PROBABILITY-II

Marks-100

6 Credits

UNIT-I

Continuous probability distributions: Uniform, Normal, Beta, Gamma, Exponential.

UNIT-II

Exact sampling distributions: Chi-square, Students 't' and Snedecor's 'F'.

UNIT-III

Characteristic function (simple applications), convergence in probability, almost sure convergence, convergence in distribution, convergence in r^{th} mean.

UNIT-IV

Weak law of large numbers: Bernoulli's WLLN, Chebyshev's inequality, Chebychev's WLLN, Poisson's WLLN and applications.

UNIT-V

Strong Law of large numbers, Kolmogorov's SLLN (Statement only). Central limit theorem, Lindeberg-Levy theorem and applications.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
2. An Outline of Statistical Theory, Vol-I, Gun, Gupta & Dasgupta, 4th Edn., World Press, 2003.

B.A./B.Sc. (STATISTICS HONOURS)

THIRD SEMESTER

C-6 (ST-3.2)

STATISTICAL METHODS-II

Marks-100

6 Credits

UNIT-I

Multivariate Data: Multiple and Partial correlations and plane of regression (three variables only).

UNIT-II

Analysis of categorical Data : Consistency of categorical data, independence and association of attributes.

UNIT-III

Concept of population, sample, parameter, statistic and sampling distribution; standard error of moments, distribution of sample mean and variance from normal distribution.

UNIT-IV

Tests of significance based on large sample: the normal test of significance (Z-test) for both one-sample and two-sample problems.

UNIT-V

Tests of significance based on exact sampling distributions, i.e. χ^2 , t and F distributions.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
2. Statistical Methods:- P.N. Arora, S. Arora & S. Arora, S. Chand, 2014.
3. Statistical methods by S.P. Gupta, Himalayan Publication, Mumbai, 2013.

B.A./B.Sc. (STATISTICS HONOURS)

THIRD SEMESTER

C-7 (ST-3.3)

STATISTICAL INFERENCE-I

Marks-100
6 Credits

UNIT-I

Point Estimation: Introduction, Properties of Estimator: unbiasedness, consistency, efficiency and sufficiency.

UNIT-II

Minimum Variance Unbiased Estimation, Rao-Cramer inequality, Rao-Blackwell theorem and applications.

UNIT-III

Methods of Estimation: Method of maximum likelihood, method of moments, properties of MLE.

UNIT-IV

Interval Estimation: Concepts of confidence interval and confidence coefficient, confidence intervals for the parameters of univariate normal distribution.

UNIT-V

Confidence belt, shortest confidence intervals, idea of confidence sets.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. An Outline of Statistical theory (Vol-II) Goon, Gupta and Dasgupta, World Press, 2007.

B.A./B.Sc. (STATISTICS HONOURS)

FOURTH SEMESTER

C-8 (ST-4.1)

STATISTICAL INFERENCE-II

*Marks-100
6 Credits*

UNIT-I

Statistical Hypotheses: Simple and composite, statistical tests, critical region, type-I and type-II error, size and power of a test, definition of Most powerful (MP), Uniformly Most Powerful (UMP) and Uniformly Most Powerful Unbiased (UMPU) tests, Type A and type A_1 critical regions.

UNIT-II

Neyman-Pearson lemma and its applications in testing of hypotheses based on Binomial, Poisson and Normal distributions.

UNIT-III

Tests of composite hypothesis: Construction of similar region, likelihood ratio test and problems based on LR test.

UNIT-IV

Non-parametric inference: Introduction, One-Sample test: Kolmogorov-Smirnov one-sample test. One sample and paired sample problems: The ordinary sign test, paired-sample sign test. Wilcoxon signed-rank test. Wilcoxon paired-sample signed-rank test.

UNIT-V

Non-parametric inference: Two-sample problems: Wald-Wolfowitz runs test, Kolmogorov-Smirnov two-sample test, U-Statistics, Mann-Whitney U-test.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Outline of Statistical theory (Vol-II) Goon, Gupta and Dasgupta, World Press, 2008.
3. Statistical Inference: Testing of Hypothesis by Srivastava & Srivastava, Oscar, 2009.

B.A./B.Sc. (STATISTICS HONOURS)

FOURTH SEMESTER

C-9 (ST-4.2)

SAMPLING THEORY

Marks-100

6 Credits

UNIT-I

Population and sample, sampling versus census, steps involved in sample surveys, principles of sample survey, random sampling versus non-random sampling, sampling and non-sampling errors.

UNIT-II

Simple Random Sampling: Drawing of random sample by different methods, SRSWR & SRSWOR, estimation of mean and variance. Stratified Random Sampling: Advantages & disadvantages, uses, allocation of sample sizes into various strata: proportional and optimum, estimation of mean and variance.

UNIT-III

Systematic sampling: Advantages and disadvantages, uses, drawing of systematic samples, estimation of mean and variance. systematic sampling versus stratified random sampling, systematic sampling when the population consists of a linear trend.

UNIT-IV

Ratio, product and regression methods of estimation, estimation of mean and variance, comparison of efficiencies.

UNIT-V

Cluster sampling: Introduction, two-stage sampling with equal first stage units, estimation of population mean and variance.

BOOKS RECOMMENDED :

1. Fundamentals of Applied Statistics-S.C. Gupta and V.K. Kapoor, Sultan Chand, 2013.
2. Sampling Techniques – W.G. Cochran, Wiley & Sons, 2007.
3. Sampling Theory of Survey with Applications by P.V. Sukhatme, B.V. Sukhatme, S.Sukhatme and C.Asok, ISAS, New Delhi, 1984.

B.A./B.Sc. (STATISTICS HONOURS)

FOURTH SEMESTER

C-10 (ST-4.3)

TIME SERIES & INDEX NUMBERS

Marks-100
6 Credits

UNIT-I

Time Series: Introduction, components of time series, methods of measuring trend: graphic, semi-average, moving average and curve fitting by least squares.

UNIT-II

Measurement of seasonal fluctuations: Simple average, Ratio-to-trend, Ratio-to-moving average & Link relatives method.

UNIT-III

Measurement Cyclic component: Harmonic analysis. measurement of irregular variation (variate difference method).

UNIT-IV

Index numbers: Introduction, problems involved in construction, unweighted & weighted index numbers (Laspeyres's, Paasche's, Drobish- Bowley, Fisher's ideal)

UNIT-V

Criteria of good index number: Unit, Time Reversal, Factor Reversal & Circular tests, cost of living index number, its construction: Aggregate Expenditure & Family Budget, uses. Base shifting, splicing and deflating of index numbers.

BOOKS RECOMMENDED :

1. Fundamentals of Applied Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Fundamentals of Statistics, Voll-II, Gun, Gupta & Dasgupta, World Press, 2007.

B.A./B.Sc. (STATISTICS HONOURS)

FIFTH SEMESTER

C-11 (ST-5.1)

OPERATIONS RESEARCH

Marks-100

6Credits

UNIT-I

Introduction, definition, scope of Operations Research, phases of Operations Research, models of Operations Research, Linear programming, formulation, procedure of solving LPP by graphical method, definition of feasible solution, basic feasible solution, slack, surplus & artificial variable & simplex method, its algorithm & solution.

UNIT-II

Two-phase method, duality in LPP, formulation, procedure of finding dual, primal dual relations.

UNIT-III

Transportation problem, mathematical formulation, definition, initial basic feasible solution, northwest corner method, least cost method, Vogel's approximation method.

UNIT-IV

Assignment problem, mathematical formulation, solution by Hungarian method.

UNIT-V

Simulation, types of simulation, Montecarlo technique, advantages & disadvantages, definition of reliability, failure rates, bathtub shaped failure rate, instantaneous failure rate.

BOOKS RECOMMENDED :

1. Operations Research by S.Kalavathy, Vikas, 2009.
2. Introduction to Operations Research by Prem Kumar Gupta, D.S. Hira and Aarti Kamboj, S.Chand and Company, 2012.
3. Operations Research by Anand Sharma, Himalayan Publishing House, 2014.
4. Operations Research by P.K Tripathy, Kalyani Publications, 1997

B.A./B.Sc. (STATISTICS HONOURS)

FIFTH SEMESTER

C-12 (ST-5.2)

VITAL STATISTICS & OFFICIAL STATISTICS

*Marks-100
6 Credits*

UNIT-I

Measurement of mortality : Crude death rate, age-specific death rates, standardized death rate, IMR, Life table, its uses, columns of life table, abridged life table (Reed Merell).

UNIT-II

Measurement of fertility: crude birth rate, general fertility rate, age-specific birth rate, total fertility rate, gross reproduction rate, net reproduction rate.

UNIT-III

Present Statistical System in India, CSO & NSSO: Functions, State Statistical Organisations: its functions and publications.

UNIT-IV

Population Census: Methods of census, salient features, its uses and problems, registration method, sample surveys, sources of demographic data.

UNIT-V

Agricultural Statistics: Yield Statistics, Area Statistics; Price Statistics, Industrial Statistics.

BOOKS RECOMMENDED:

1. Fundamentals of Applied Statistics, S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Indian Official Statistical System: M.R. Saluja, Publication Society, 2006
3. Statistical System in India: Asthna & Srivastav, S. Chand, 2009.

B.A./B.Sc. (STATISTICS HONOURS)

SIXTH SEMESTER

C-13 (ST-6.1)

DESIGN AND ANALYSIS OF EXPERIMENTS & STATISTICAL QUALITY CONTROL

*Marks-100
6 Credits*

UNIT-I

Analysis of Variance: Introduction, one-way & two-way classifications (with one observation per cell) with fixed effect model and their analysis.

UNIT-II

Basic principles of experimental design: replication, randomization and local control, Completely Randomized Design, Randomized Block Design. Estimation of missing observation in RBD. Efficiency of RBD w.r.t. CRD.

UNIT-III

Latin Square Design and its analysis, estimation and analysis of missing value in Latin Square Design, comparison of efficiency Advantages, factorial experiments(Z^2 and Z^3).

UNIT-IV

Meaning and uses of SQC, process and product control, chance and assignable causes of variation, 3-sigma control limits. \bar{X} and R charts, control chart for attributes, control chart for standard deviation, p-chart, d-chart.

UNIT-V

Natural tolerance limit and specification limit, acceptance sampling by attributes, AQL, LTPD, AOQL & ASN consumer's risk and producer's risk, O.C. curve. Idea about single and double sampling plans.

BOOKS RECOMMENDED :

1. Design and Analysis of Experiments by Das and Giri, Wiley Eastern, ND, 2008.
2. Fundamentals of applied Statistics – S.C. Gupta and V.K. Kapoor, Sultan Chand, 2013.
3. Fundamentals of Statistics (Vol-II)-Goon, Gupta and Dasgupta, World Press, 2007.

B.A./B.Sc. (STATISTICS HONOURS)

SIXTH SEMESTER

C-14 (ST-6.2)

COMPUTER APPLICATIONS FOR STATISTICAL PROBLEMS

Marks-100
6 Credits

UNIT-I

Computer fundamental: Definition, history of computer, generation of computer, input/output unit, Central Processing Unit, Booting, Memory, Number System. Hardware, Computer Virus, Internet, MS-Office (word, Excel, PPT).

UNIT-II

Fundamental of C++ Programming: Introduction, concept & history of language, Basic Structure writing & Executing a C++ Program, keywords. constants, variables, C++ data type operator (Logical, Arithmetic, Float, double string, Numeric) (HLL, LLL), loops, statements (If, If-else, for , do, do-while).

UNIT-III

MS Excel: Determination of mean averages, median, mode, standard deviation, minimum, maximum and correlation wefficient.

UNIT-IV

C++ Assignment programme: Display a string Hello Statistics, simple mathematical expression .

UNIT-V

Writing down the programme for statistical data analysis to construct frequency distribution table and to find out mean, variance, C.V., Correlation and Regression coefficient.

BOOKS RECOMMENDED :

1. C++ by Yashwant Kanetkar, Bpb Publications, 2012.
2. Computer based Numerical & Statistical Techniques by S. Kumar, S.Chand, 2012.
3. Object Oriented Programming with C++ by E.Balagurusamy, TMH, LPE, ND, 2010.
4. Programming in C by B.L. Jumeja & Anita Seth, Cengage Publication, 2011.

B.A./B.Sc. (HONOURS)

FIFTH SEMESTER

DSE-1(ST-5.1)

STATISTICAL METHODS-IMarks-100

6 Credits

UNIT-I

Ideas about types of data, collection, classification and tabulation and presentation of data. Frequency distributions: graphic and diagrammatic representation of data.

UNIT-II

Analysis of Quantitative Data: Concepts of central tendency, dispersion and relative dispersion; moments, skewness and kurtosis and their measures including those based on quantiles and moments.

UNIT-III

Bivariate Data: Scatter diagram, Curve fitting by the method of least squares (linear, quadratic and exponential).

UNIT-IV

Correlation Coefficient: Product moment correlation coefficient and its properties, coefficient of determination, correlation ratio, rank correlation.

UNIT-V

Regression Analysis: Concept of regression, fitting of regression lines, regression coefficients and their properties.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
3. Statistical Methods by S.P. Gupta, Himalayan Publishing House, 2014.

B.A./B.Sc. (HONOURS)

FIFTH SEMESTER

DSE-2 (ST-5.2)

PROBABILITY

Marks-100

6 Credits

UNIT-I

Random experiment : trials, sample point and samples space, event, operations of events. Concepts of mutually exclusive and exhaustive events.

Definition of Probability : Classical, relative frequency and axiomatic approach; discrete and continuous probability space, addition law of probability.

UNIT-II

Multiplication laws of probability, conditional probability and independence of events, multiplication laws of probability, Bayes' theorem and its applications.

UNIT-III

Random variables; probability mass function, probability density function; distribution function, joint, marginal and conditional distributions.

UNIT-IV

Mathematical Expectation of a random variable and its properties, moment generating function, Cumulant generating function and probability generating function.

UNIT-V

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson, Continuous probability distribution: Normal.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Fundamentals of Statistics by S.C. Gupta, Himalayan Publishing House, 2014.

B.A./B.Sc. (HONOURS)

SIXTH SEMESTER

DSE-3 (ST-6.1)

STATISTICAL METHODS-II

*Marks-100
6 Credits*

UNIT-I

Multivariate Data: Multiple and Partial correlation and plane of regression (three variables only).

UNIT-II

Analysis of categorical Data : Consistency of categorical data, independence and association of attributes.

UNIT-III

Concept of population, sample, parameter, statistic and sampling distribution; standard error of moments, distribution of sample mean and variance from normal distribution.

UNIT-IV

Tests of significance based on large samples (one-sample and two-sample problems).

UNIT-V

Tests of significance based on Chi-square, Student's 't' and Snedecor's 'f' distributions.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
2. Statistical methods by S.P. Gupta, Himalayan Publication, Mumbai, 2013.
3. Statistical Methods:- P.N. Arora, S. Arora & S. Arora, S. Chand, 2013.

B.A./B.Sc. (HONOURS)

SIXTH SEMESTER

DSE-4
(PROJECT REPORT)
B.A./B.Sc. (HONOURS)

FIRST SEMESTER

GE-1(ST-1.1)

STATISTICAL METHODS-I

Marks-100

6 Credits

UNIT-I

Ideas about types of data, collection, classification and tabulation of data. Frequency distributions: graphic and diagrammatic representation of data .

UNIT-II

Measures of central tendency: arithmetic mean, geometric mean & harmonic mean their properties & applications. Median & mode & other partition values: quartiles, deciles, percentiles and graphic presentation.

UNIT-III

Measures of dispersion: range, quartile deviation, mean deviation standard deviation & variance, coefficient of variance. Moments, skewness and kurtosis .

UNIT-IV

Bivariate data: scatter diagram, curve fitting by method of least squares (straight line and second degree), product moment correlation coefficient and its properties, coefficient of rank correlation.

UNIT-V

Concept of regression, fitting of regression lines, regression coefficients, their properties, angle between two regression lines.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.

B.A./B.Sc. (HONOURS)

SECOND SEMESTER

GE-2 (ST-2.1)

PROBABILITY AND PROBABILITY DISTRIBUTIONS

Marks-100

6 credits

UNIT-I

Random experiment: trials, sample point and sample space, event, operations of sets and events, concepts of mutually exclusive and exhaustive events. Definition of Probability: classical, relative frequency and axiomatic approach and illustrations.

UNIT-II

Discrete and continuous probability space, addition law of probability, conditional probability and independence of events, multiplication laws of probability.

UNIT-III

Random variable; probability mass function, probability density function; distribution function, joint, marginal and conditional distributions, Mathematical Expectation of a random variable and its properties.

UNIT-IV

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson and their mean and variance only .

UNIT-V

Continuous probability distributions: Uniform and Normal with its properties.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014.

B.A./B.Sc. (HONOURS)

THIRD SEMESTER

GE-3(ST-3.1)

Sample Surveys and Time Series Analysis

Marks-100

6 Credits

UNIT-I

Population and sample, sampling versus census, steps involved in sample surveys, principle of sample survey, random sampling versus non-random sampling, errors: sampling and non-sampling errors.

UNIT-II

Simple Random Sampling: drawing of random sample by different techniques, SRSWOR and SRSWR, sampling for proportions.

UNIT-III

Stratified Random Sampling: advantages & disadvantages, uses, allocation of sample sizes into various strata: proportional and optimum allocations.

UNIT-IV

Time Series: Introduction, components of time series, uses and analysis of time series, methods of measuring trend.

UNIT-V

Methods of Measuring of Seasonal variation: Simple average, Ratio-to-trend, Ratio-to-moving average and link relatives.

BOOKS RECOMMENDED :

1. Fundamentals of Applied Statistics-S.C. Gupta and V.K. Kapoor, Sultan Chand, 2013.
2. Fundamental of Statistics (Vol-II)- Goon, Gupta and Dasgupta , World Press, 2007.

B.A./B.Sc. (HONOURS)

FOURTH SEMESTER

GE-4(ST-4.1)

Design and Analysis of Experiments & Vital Statistics

Marks-100
6 credits

UNIT-I

Analysis of Variance: Introduction, one & two-way (with one observation per cell) classifications with fixed effect models.

UNIT -II

Principles of experimental design: replication, randomization and local control, completely randomized design, randomized block design, estimation of one missing value in RBD.

UNIT-III

Concept of vital statistics, uses of vital statistics, methods of obtaining vital statistics: registration method, census method. Measurement of mortality: crude death rate, age-specific death rates, standardized death rate, infant mortality rate.

UNIT-IV

Life table, its uses, columns of life table, construction of Reed Merrell abridged life table (without derivation).

UNIT-V

Measurement of fertility: crude birth rate, general fertility rate, age-specific birth rate, total fertility rate, gross reproduction rate, net reproduction rate.

BOOKS RECOMMENDED :

1. Fundamentals of applied Statistics – S.C. Gupta and V.K. Kapoor, Sultan Chand, 2013.
2. Fundamentals of Statistics (Vol-II)-Goon, Gupta and Dasgupta, World Press, 2007.

B.Sc.(Pass)
FIRST SEMESTER
(DSC-ST-A)

STATISTICAL METHODS-I Marks-100

6 Credits

UNIT-I

Ideas about types of data, collection and classification of data, tabulation of data. Frequency distributions: graphic and diagrammatic representation of data.

UNIT-II

Analysis of Quantitative Data: Concepts of central tendency, dispersion and relative dispersion; moments, skewness and kurtosis and their measures including those based on quartiles and moments.

UNIT-III

Bivariate Data: Scatter diagram, curve fitting by the method of least squares (linear and quadratic), fitting of curves reducible to polynomials by log and inverse transformation.

UNIT-IV

Correlation Coefficient: Product moment correlation coefficient and its properties, coefficient of determination, correlation ratio, rank correlation.

UNIT-V

Regression Analysis: Concept of regression, fitting of regression lines, regression coefficients and their properties.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
3. Statistical Methods by P.N. Arora, S. Arora & S. Arora, S. Chand, 2014.

B.Sc.(Pass)
SECOND SEMESTER
(DSC-ST-B)

PROBABILITY AND PROBABILITY DISTRIBUTIONS

Marks-100
6 Credits

UNIT-I

Random experiment: trials, sample point and samples space, events, operations of events, concepts of mutually exclusive and exhaustive events. Definition of Probability : Classical, relative frequency and axiomatic approach; discrete and continuous probability space, addition law of probability.

UNIT-II

Multiplication laws of probability, conditional probability and independence of events, Bayes' theorem and its applications.

UNIT-III

Random variables; probability mass function, probability density function; distribution function, joint, marginal and conditional distributions.

UNIT-IV

Mathematical Expectation of a random variable and its properties, moment generating function, cumulant generating function and probability generating function.

UNIT-V

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson. Continuous probability distributions: continuous uniform, Normal and Gamma.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
2. Probability and Statistics by Purna Chandra Biswal, PHI EEE, 2007.

B.Sc.(Pass)
THIRD SEMESTER

(DSC-ST-C)

STATISTICAL METHODS-II
& SAMPLING Marks-100

6 Credits

UNIT-I

Concept of population, sample, parameter, statistic and sampling distribution; standard error

Tests of significance based on large samples (Z-test).

UNIT-II

Concepts of χ^2 , t and F distributions and tests of significance based on χ^2 , t and F distributions.

UNIT-III

Analysis of categorical Data: Consistency of categorical data, independence and association of attributes.

UNIT-IV

Population and sample, sampling versus census, steps involved in sample surveys, principles of sample survey, random sampling versus non-random sampling, sampling and non-sampling errors.

UNIT-V

Simple Random Sampling: Drawing of random sample by different methods, SRSWR & SRSWOR, estimation of mean and variance. Stratified Random Sampling: Advantages & disadvantages, uses, estimation of mean and Variance only.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
2. Statistical methods by S.P. Gupta, Himalayan Publication, Mumbai, 2013.
3. Fundamentals of Applied Statistics by S.C. Gupta and V.K. Kapoor.

B.Sc.(Pass)
FOURTH SEMESTER
(DSC-ST-D)

**DESIGN AND ANALYSIS OF EXPERIMENT,
OPERATIONS RESEARCH AND TIME SERIES**

Marks-100
6 Credits

UNIT-I

Analysis of Variance: Introduction, one-way & two-way classifications (with one observation per cell) with fixed effect model and their analysis.

UNIT-II

Basic principles of experimental design: replication, randomization and local control completely Randomized Design, Randomized Block Design.

UNIT-III

Introduction, definition, scope of Operations Research, Linear programming problems formulation, procedure of solving LPP by graphical method.

UNIT-IV

Definition of feasible solution, basic feasible solution, slack, surplus & artificial variables, simplex method, its algorithm & solution.

UNIT-V

Time Series: Introduction components of time series, methods of measuring trend: Graphic, Semi-average, moving average and curve fitting by Least Squares.

BOOKS RECOMMENDED :

1. Fundamentals of Applied Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012
2. Operations Research by S. Kalavathy, Vika, 2009

B.Sc.(Pass)
FIFTH SEMESTER
(DSE-ST-A)

STATISTICAL METHODS Marks-100

6 Credits

UNIT-I

Ideas about types of data, collection and classification of data, tabulation, graphic and diagrammatic presentation of data. Frequency distributions.

UNIT-II

Analysis of Quantitative Data: Concepts of central tendency, dispersion and relative dispersion; moments, skewness and kurtosis and their measures including those based on quartiles and moments.

UNIT-III

Bivariate Data : Scatter diagram, curve fitting by the method of least squares (linear and quadratic).

UNIT-IV

Correlation Coefficient: Product moment correlation coefficient and its properties, coefficient of determination, correlation ratio, Rank correlation, Intra-class correlation.

UNIT-V

Regression Analysis: Concept of regression, fitting of regression lines, regression coefficients and their properties.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
3. Statistical Methods by P.N. Arora, S. Arora & S. Arora, S. Chand, 2014.

B.Sc.(Pass)
SIXTH SEMESTER
(DSE-ST-B)

PROBABILITY& PROBABILITY DISTRIBUTIONS

Marks-100

6 Credits

UNIT-I

Random experiment: trials, sample point and samples space, event, operations of events. Concepts of mutually exclusive and exhaustive events. Definition of Probability: Classical, relative frequency and axiomatic approach; discrete and continuous probability space, addition law of probability.

UNIT-II

Multiplication laws of probability, conditional probability and independence of events, multiplication laws of probability, Bayes' theorem and its applications.

UNIT-III

Random variables; probability mass function, probability density function; distribution function, joint, marginal and conditional distributions.

UNIT-IV

Mathematical Expectation of a random variable and its properties, moment generating function, Cumulant generating function and probability generating function.

UNIT-V

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson, continuous probability distribution: Normal.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Mathematical Statistics by J.N. Kapoor & H.C. Saxena, S. Chand, 2011.

B.A.(Pass)
FIRST SEMESTER
(DSC-ST-A)
STATISTICAL METHODS-I Marks-100

6 Credits

UNIT-I

Ideas about types of data, collection and classification of data, tabulation of data. Frequency distributions: graphic and diagrammatic representation of data.

UNIT-II

Analysis of Quantitative Data: Concepts of central tendency, dispersion and relative dispersion; moments, skewness and kurtosis and their measures including those based on quartiles and moments.

UNIT-III

Bivariate Data: Scatter diagram, curve fitting by the method of least squares (linear and quadratic), fitting of curves reducible to polynomials by log and inverse transformation.

UNIT-IV

Correlation Coefficient: Product moment correlation coefficient and its properties, coefficient of determination, correlation ratio, rank correlation.

UNIT-V

Regression Analysis: Concept of regression, fitting of regression lines, regression coefficients and their properties.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
3. Statistical Methods by P.N. Arora, S. Arora & S. Arora, S. Chand, 2014.

B.A.(Pass)
SECOND SEMESTER
(DSC-ST-B)

PROBABILITY AND PROBABILITY DISTRIBUTIONS

Marks-100

6 credits

UNIT-I

Random experiment: trials, sample point and samples space, event, operations of events. Concepts of mutually exclusive and exhaustive events. Definition of Probability : Classical, relative frequency and axiomatic approach; discrete and continuous probability space, addition law of probability.

UNIT-II

Multiplication laws of probability, conditional probability and independence of events, multiplication laws of probability, Bayes' theorem and its applications.

UNIT-III

Random variables; probability mass function, probability density function; distribution function, joint, marginal and conditional distributions.

UNIT-IV

Mathematical Expectation of a random variable and its properties, moment generating function, cumulant generating function and probability generating function.

UNIT-V

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson. Continuous probability distributions: continuous Uniform, Normal, Gamma.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
2. Probability and Statistics by Purna Chandra Biswal, PHI EEE, 2007.

B.A.(Pass)
THIRD SEMESTER
(DSC-ST-C)
STATISTICAL METHODS-II
& SAMPLING Marks-100
6 Credits

UNIT-I

Concept of population, sample, parameter, statistic and sampling distribution; standard error. Tests of significance based on large samples (Z-test).

UNIT-II

Concepts of χ^2 , t and F distributions and Tests of significance based on χ^2 , t and F distributions.

UNIT-III

Analysis of categorical Data: Consistency of categorical data, independence and association of attributes.

UNIT-IV

Population and sample, sampling versus census, steps involved in sample surveys, Principle of sample survey, random sampling versus non-random sampling, sampling and non-sampling errors.

UNIT-V

Simple Random Sampling: Drawing of random sample by different methods, Estimation of mean and Variance. Stratified Random Sampling: Advantages & disadvantages, Uses, Estimation of mean and Variance only.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
2. Statistical methods by S.P. Gupta, Himalayan Publication, Mumbai, 2013.
3. Statistical Methods:- P.N. Arora, S. Arora & S. Arora, S. Chand, 2013.

B.A.(Pass)
FOURTH SEMESTER

(DSC-ST-D)

**DESIGN AND ANALYSIS OF EXPERIMENT,
OPERATIONS RESEARCH AND TIME SERIES**

Marks-100
6 Credits

UNIT-I

Analysis of Variance: Introduction, one & two way classification (with one observation per cell) with fixed effect model and their analysis.

UNIT-II

Basic Principles of experimental design: replication, randomization and local control completely Randomized Design, Randomized Block Design.

UNIT-III

Introduction, Definition, Scope of operations research, Linear programming problems formulation, procedure of solving LPP by graphical method.

UNIT-IV

Definition of feasible solution, basic feasible solution, slack, surplus & artificial variables, simplex method, its algorithm & solution.

UNIT-V

Time Series: Introduction components of time series, methods of measuring trend: Graphic, Semi-average, moving average and curve fitting by Least Squares.

BOOKS RECOMMENDED :

1. Fundamentals of Applied Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012
2. Operations Research by S. Kalavathy, Vika, 2009

B.A.(Pass)
FIFTH SEMESTER
(DSE-ST-A)

STATISTICAL METHODS Marks-100

6 Credits

UNIT-I

Ideas about types of data, collection, classification of data & tabulation of data. Frequency distributions: graphic and diagrammatic presentation of data.

UNIT-II

Analysis of Quantitative Data: Concepts of central tendency, dispersion and relative dispersion; moments, skewness and kurtosis and their measures including those based on quartiles and moments.

UNIT-III

Bivariate Data : Scatter diagram, curve fitting by the method of least squares (linear and quadratic).

UNIT-IV

Correlation Coefficient: Product moment correlation coefficient and its properties, coefficient of determination, correlation ratio, Rank correlation, Intra-class correlation.

UNIT-V

Regression Analysis: Concept of regression, fitting of regression lines, regression coefficients and their properties.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.
3. Statistical Methods by P.N. Arora, S. Arora & S. Arora, S. Chand, 2014.

B.A.(Pass)
SIXTH SEMESTER
(DSE-ST-B)

PROBABILITY & PROBABILITY DISTRIBUTIONS

Marks-100

6 Credits

UNIT-I

Random experiment: trials, sample point and samples space, event, operations of events. Concepts of mutually exclusive and exhaustive events. Definition of Probability: Classical, relative frequency and axiomatic approach; discrete and continuous probability space, addition law of probability.

UNIT-II

Multiplication laws of probability, conditional probability and independence of events, multiplication laws of probability, Bayes' theorem and its applications.

UNIT-III

Random variables; probability mass function, probability density function; distribution function, joint, marginal and conditional distributions.

UNIT-IV

Mathematical Expectation of a random variable and its properties, moment generating function, Cumulant generating function and probability generating function.

UNIT-V

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson, continuous probability distribution: Normal.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Mathematical Statistics by J.N. Kapoor & H.C. Saxena, S. Chand, 2011.

B.A.(Pass)

FIFTH SEMESTER

GE-I(ST-5.1)

STATISTICAL METHODS Marks-100

6 Credits

UNIT-I

Ideas about types of data, collection, classification and tabulation of data. Frequency distribution: graphic and diagrammatic representation of data.

UNIT-II

Measures of central tendency: Arithmetic mean, Geometric mean & Harmonic mean their properties & applications. Median & Mode & other partition values: quartiles, deciles, percentiles and graphic presentation.

UNIT-III

Measures of Dispersion: range, quartile deviation, mean deviation standard deviation & variance, coefficient of variance, moments, skewness and kurtosis .

UNIT-IV

Bivariate Data: Scatter diagram, curve fitting by method of least squares (straight line and second degree), product moment correlation coefficient and its properties Coefficient of rank correlation.

UNIT-V

Concept of regression, fitting of regression lines, regression coefficients, their properties.

Angle between two regression lines.

BOOKS RECOMMENDED :

1. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014
2. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2013.

B.A.(Pass)
SIXTH SEMESTER

GE-II(ST-6.1)

PROBABILITY AND PROBABILITY DISTRIBUTIONS

Marks-100
6 credits

UNIT-I

Random experiment: trials, sample point and sample space, events, operations of sets and events. concepts of mutually exclusive and exhaustive events. Definition of Probability: Classical, relative frequency and axiomatic approach and Illustrations.

UNIT-II

Discrete and continuous probability space, addition law of probability, conditional probability and independence of events, multiplication laws of probability.

UNIT-III

Random variable; probability mass function, probability density function; distribution function, joint, marginal and conditional distributions, Mathematical Expectation of a random variable and its properties.

UNIT-IV

Discrete probability distributions: Uniform, Bernoulli, Binomial, Poisson and their mean and variance.

UNIT-V

Continuous probability distributions: Uniform (mean and variance) and Normal with its characteristics.

BOOKS RECOMMENDED :

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand, 2012.
2. Mathematical Statistics by J.N. Kapoor & H.C. Saxena, S. Chand, 2011.
3. Fundamentals of Statistics by S.C Gupta, Himalayan Publishing House, 2014.