M.Sc. STATISTICS

M.Sc. (Statistics)-I year

SEMESTER-I		SEMESTER-II	
Paper No.	**Name of the paper**	**Paper No.**	**Name of the paper**
STT 01	Real Analysis	STT 06	Probability Theory
STT 02	Linear Algebra	STT 07	Linear Models and Regression Analysis
STT 03	Distribution Theory	STT 08	Statistical Inference
STT 04	Sampling Methods	STT 09	Multivariate Analysis
STT 05	Operations Research	STT 10	Statistical Computing (programming)
STP 01	Practical-I (based on STT 02 and STT 05)	STP 03	Practical-II (based on STT 08 and STT 09)
STP 02	Practical-II (based on STT 03 and STT 04)	STP 04	Practical-IV (based on STT 07 and STT 10)

M.Sc. (Statistics)-II year

SEMESTER-III		SEMESTER-IV	
Paper No.	**Name of the paper**	**Paper No.**	**Name of the paper**
STT 11	Industrial Statistics	STT 16	Financial Mathematics
STT 12	Stochastic Processes	STT 17	Finance and Financial Reporting
STT 13	Agricultural Statistics (Design of Experiments)	STT 18	Contingencies
STT 14	Econometrics	STT 19	Demography
STT 15	Decision Theory/Time series Analysis	STT 20	Financial & Statistical Economics
STP 05	Practical-V (based on STT 11 and STT 12)	STP 07	Practical-VII (based on STT 16 and STT 17)
STP 06	Practical-VI (based on STT 13 , STT 14 and STT 15)	STP 08	Practical-VIII (based on STT 18 , STT 19 and STT 20)
		STM 02	Project (carrying 100 marks)

NOTE:

1) Each semester will have five theory papers and assessment for each theory paper will be of 100 Marks (50 External Exam+ 50 Internal Exam[02 tests each of 15 Marks+10 Marks for assignment+ 10 Marks for Class Performance)).
2) Practical-I, II, III, IV, V, VI, VII, VIII will carry 50 marks each.
3) (i)Project carrying 100 marks which is to be given at the beginning of sem-III and evaluated at the end of sem-IV.
   (ii)Project batch is of minimum 02 and maximum 04 students.
4) Sem-I,sem-II and sem-III are of 600 marks each, sem-IV is of 700 marks each.
5) Total marks for sem I+ sem II+ sem III + sem IV = 2500.
6) Total degree is of 2500 Marks, converted in the form of 100 credits CGPA system.
   one credit is of 25 marks.
7) In paper STT-10 i.e. in Statistical Computing EDA using 'R' software will be taken

SEMESTER I

STT 01 **REAL ANALYSIS**

(Maximum no. of periods = 60)

UNIT I: The Real Number System: Rational numbers, Irrational numbers, Upper bounds, Lower bounds, Least upper bound(supremum), Greatest lower bound(infimum) of the sets of real numbers. The completeness axiom,some properties of the supremum and infimum, Archimedean property of the real number system. Absolute value and the triangle inequality, The Cauchy-Schwarz inequality, plus and minus infinity and the extended real number system R*.

UNIT II: Basic Notions of Set Theory: Similar (equinumerous) sets, Finite and infinite sets, Countable and uncountable sets, Uncountability of real number system. Set algebra, countable collections of countable sets and related results. Elements of Point Set Topology: Introduction to n-dimensional Euclidean space,Open and closed intervals(rectangles),Open and closed sets on the real line,limit points of a set,Compact set.The Bolzano-Weierstrass theorem,Heine-Borel theorem for real line R (without proof).

UNIT III: Sequences and Series of Real Numbers: Introduction and examples of sequences of real number. Convergence of sequences, limit of a sequence, limit superior and limit inferior of a real valued sequences, Monotone sequences of real numbers .Cauchy sequences and related results. Infinite series, Alternating series. Convergence of series, Absolute and conditional convergence. Test for convergence of series with positive terms(Comparison test and limit comparison test). The geometric series. The integral test. The bigO(h)and little o(h) notation. The Ratio test and Root test.

UNIT IV: Limit and Continuity : Limits of functions ,Continuous functions, Uniform continuity, Discontinuities, Continuity and Compactness ,Monotone function and discontinuities. Sequences of Functions: Introduction and examples of sequences of real-valued functions, Pointwise convergence of sequences of functions, Definition of uniform convergence, Uniform convergence and continuity ,Power series and radius of convergence.

UNIT V: Differentiation and functions of several variables: The Derivative of a Real Function, Maxima-minima of function, Mean value theorems. The Continuity and Derivatives, Derivatives of higher order, Taylor's theorem(without proof),Functions of several variables,constrained maxima-minima functions. **Integrals:** Riemann and Riemann-Stieltjes integrals ,integration by parts, mean value theorem, Multiple integrals and their evaluation by repeated integration,Change of variables in multiple integration,Improper Riemann-Stieltjes integrals,Improper integrals of first and second kind for one variable,uniform convergence of improper integrals.Differentiation under the sign of integral Leibnitz rule.

REFERENCES:

1) Apostol T.M.(1985) Mathematical Analysis, Narosa,Indian Ed.
2) Courant R. And John F.(1965) Introduction to Calculas and Analysis, Wiley.
3) Miller K.S.(1957)Advanced Real Calculas,Harper, New York.
4) Rudin ,Walter(1976) Principles of Mathematical Analysis,McGraw Hill.
5) Malik S.C.(2005)Principles of Real Analysis, New Age International (p)Ltd.
6) Bartle R.G.(1976)Elements of Real Analysis, Wiley.

STT 02 **LINEAR ALGEBRA**

(Maximum no. of periods = 60)

UNIT I: Fields, vector spaces, subspaces, linear dependence and independence, basis and dimension of a vector space, finite dimensional vector spaces, completion theorem, examples of vector spaces over real and complex fields, linear equations.

UNIT II: Vector spaces with an inner product, Gram-Schmidt orthogonalization process, orthonormal basis and orthogonal projection of a vector.

UNIT III: Linear transformations, algebra of matrices, row and column spaces of a matrix, elementary matrices, determinants, rank and inverse of a matrix, null space and nullity, partitioned matrices, Kronecker product.

UNIT IV: Hermite canonical form, generalized inverse, Moore-Penrose generalized inverse, idempotent matrices, Solutions of matrix equations**.** Real quadratic forms,reduction and classification of quadratic forms, index and signature, triangular reduction of a positive definite matrix. Characteristic roots and vectors, Cayley-Hamilton theorem, minimal polynomial, similar matrices, algebraic and geometric multiplicity of a characteristic root, spectral decomposition of a real symmetric matrix, reduction of a pair of real symmetric matrices, Hermitian matrices**.**

UNIT V: Singular values and singular value decomposition, Jordan decomposition, extrema of quadratic forms, vector and matrix differentiation.

REFERENCES:

1) Graybill F.A.(1983)Matrices with applications in statistics,2nd Ed. Wadsworth.

2) Rao C.R.(1973) Linear statistical inference and its applications,2nd ed. John Wiley and Sons, Inc.

3) Searle S.R.(1982) Matrix Algebra useful for Statistics, John Wiley and Sons, Inc.

Additional References:

1) Bellman R.(1970)Introduction to Matrix Analysis,2nd ed.McGraw Hill.

2) Biswas S.(1984) Topics in Algebra of Matrices,Academic Publications.

3) Hadley G.(1987)Linear Algebra,Narosa Publishing House.

4) Halmos P.R.(1958)Finite Dimensional Vector Spaces,2nd ed.

5) Hoffman K.and Kunze R.(1971)Linear Algebra,2nd ed.Prentice Hall Inc.

6) Rao A.R. and Bhimasankaran P.(1992) Linear Algebra,Tata McGraw Hill Pub. Company Ltd.

7)Rao C.R. and Mitra S.K.(1971)Generalized Inverse of Matrices and its Applications, John Wiley and Sons.

STT 03 **DISTRIBUTION THEORY**

(Maximum no. of periods = 60)

UNIT I: Brief review of basic distribution theory: Random experiment and its sample space, events, Probability axioms, Random variables, Discrete random variables, Continuous random variables, P.d.f. ,P.m.f. ,c.d.f. of random variables, M.g.f., p.g.f. c.g.f. ,characteristic function of random variables, Moments: raw moments, Central moments, Factorial moments.

UNIT II: Standard discrete and continuous distributions: Bernoulli, Binomial, Geometric, Negative Binomial, Poisson, Hypergeometric distributions. Exponential, Normal, Gamma ,Beta, Uniform, Chi-square, Lognormal, Weibull, Cauchy distributions. M.g.f., p.g.f., c.g.f., characteristic function , Moments of above distributions.Properties of above distributions.

UNIT III: Joint ,Marginal and Conditional distributions: Concept of random vectors, Joint, Marginal and conditional distributions Variance-covariance matrix. Joint p.m.f. of discrete random variables, Joint p.d.f. of continuous random variables.Marginal and conditional density using joint density. Conditional expectation and variance. Independence of random variables. Bivariate normal distributions. Joint p.d.f., Marginal p.d.f.s, Conditional p.d.f. , joint m.g.f., Some properties. Multinomial distribution: joint p.m.f., Marginal p.m.f., Conditional p.m.f., Joint m.g.f. Functions of random variables and their distributions:
Function of random variables. Joint density of functions of random variables using Jacobian transformation. Convolution of random variables. Compound ,Truncated and Mixture Distributions:Concept, applications,examples and problems.

UNIT IV: Sampling Distributions: Introduction, Sampling distribution of statistics from univariate normal random samples.Non-central Chi-square, t and F-distributions and their properties (Derivatives are not expected). Quadratic forms under Normality: Distribution of linear and quadratic forms in i.i.d.Standard normal variables (Technique based on m.g.f.)Independence of two linear forms, Independence of two quadratic forms and independence of linear form and quadratic form. Fisher Cochran's theorem.

UNIT V: Order Statistics: Distribution of r^{th} order statistics, Joint distribution of several order statistics and their functions. Distribution of function of order Statistics. Extreme values and their asymptotic distributions (statement only) with applications.

REFERENCES:

1)Rohatgi V.K. and Ehsanes Saleh A.K.MD.(2003) An Introduction to probability theory and Mathematical Statistics (Wiley Eastern ,2^{nd} Ed.)

2)Hogg R.V. and Craig A.T.(1978) Introduction to Mathematical Statistics(5^{th} Ed.Pearsons Education)

3)Hogg R.V. and Tanis E.(2002)An Probability and Statistical Inference(6^{th} Ed.Pearsons Education)

4)Rao C.R.(2002)Linear Statistical Inference and its Applications(2^{nd} Ed.,Wiley Eastern)

5)Dudewicz E.J.and Mishra S.N.(1988)Modern Mathematical Statistics,(Wiley & Sons)

Additional Refernces:-

Pitman J.(1993) Probability,(Narosa Publishing House)

Johnson S.and Kotz (1972)Distributions in Statistics(Vol.I,IIand III,Houghton and Miffin)

Cramer H.(1946)Mathematical Methods of Statistics(Princeton)

STT 04 **SAMPLING METHODS**

(Maximum no. of periods = 60)

UNIT I: Preliminaries: Objectives of sample survey, planning for sample survey. Sampling and non-sampling errors.

UNIT II: Basic methods of sample selection from finite population: Simple random sampling with replacement, Simple random sampling without replacement, Systematic sampling and related results on estimation of population total mean and proportion. Stratified sampling: Formation of strata and number of strata, Allocation problems and estimation problems.

UNIT III: Unequal Probability Sampling Designs: Inclusion probabilities, Horwitz - Thompson estimator and its properties. PPSWR, PPSWOR methods(including Lahiri's scheme)and related estimators of a finite population mean (Heansen-Horwitz and Desraj estiomators for a general sample size and Murthy's estimator for a sample of size 2) Midzuno sampling design.

UNIT IV: Use of supplementary information for estimation, Ratio and Regression estimators based on SRSWOR method of sampling, their properties and MSEs. The Jackknife technique. Cluster sampling, Estimator of population mean and its properties. Two-stage sampling with equal number of second stage units. Double sampling and its uses in ratio and regression estimation. Randomized response technique, Warner's model, related and unrelated questionnaire methods.

UNIT V: Statistics for National Development: Economic Development: Growth in per capita income and distributive justice. Indices of development. Human Development indexes. Estimation of national income-product approach, income approach and expenditure approach. population growth in developing and developed countries ,Population projection using Leslie matrix, Labour force projection. Measuring inequality in incomes, Lorenz curve, Gini coefficient, Theil's measure. Poverty measurement: Different issues related to poverty, Measures of incidence and intensity, Combined measures e.g. Indices due to Kakwani, Sen etc.

REFERENCES:

1) Chaudhari A. And Mukerjee R. (1988) Randomized Response: Theory and Techniques, New York, Marcel Dekker Inc.
2) Cochran W.G.(1984) Sampling Techniques, Wiley.
3) Des Raj and Chandok(1999)Sample Survey Theory, Narosa.
4) Murthy M. N.(1977) Sampling Theory and Methods, Statistical Pub. Society, Calcutta.
5) Sukhatme P.V., Sukhatme B.V. and Ashok C.(1984)Sampling Theory of Surveys with Applications, Iowa state University Press and IARS.
6) Singh D. and Chaudhary F. S. (1986) Theory and Analysis of Sample Survey Designs, New Age International Publishers.
7) Mukhopadhay P.(2002) Theory and Methods of Sample Survey, Chpman and Hall.

Statistics for National Developement:

1) CSO.National Accounts Statistics-Sources and Health.
2) Keyfitz N.(1977)Applied Mathematical Demography, Springer Verlag.
3) UNESCO,Principles for Vital Statistics Systems,Series M-12
4) Sen A. (1977)Poverty and Inequality.
5) Datt R.,Sundharam K.P.M.(Revised edition)Indian Economy, S. Chand & company Ltd.
6) Johnson S.and Kotz (1972)Distributions in Statistics, Vol.I, II& III,Houghton and Miffin.
7) Cramer H.(1946)Mathematical Methods of Statistics, Princeton.

STT 05 **OPERATIONS RESEARCH**

(Maximum Number of Periods: 60)

UNIT I: Operations research & its scope, Necessity of operations research in industry, Introductions to Linear programming problems, General linear programming problems , Mathematical Formulation of L.P.P., Basic solution, Important theorems, solution of linear programming problem, Graphical method for solution , convex set , some important theorems, Revised simplex method, dual simplex method.

UNIT II: Theory of Simplex methods: Introduction, slack and surplus variables, some definitions and notations, Fundamental theorems of linear programming, BSF from F.S., Improved B.S.F. Unbounded solution, optimality of solutions.

UNIT III: computational procedure of simplex method for the solution of a maximization L.P.P., artificial variable technique, duality and sensitivity analysis.

UNIT IV: Introduction, competitive game, finite and infinite game, two person zero sum game, rectangular game , solution of game, saddle point, solution of a rectangular game with saddle point.

UNIT V: PERT-CPM, product planning control with PERT-CPM.

REFERENCES:

1) R. K. Gupta "Linear Programming",Krishna Prakashan Mandir.

2) F.S.Hillier and G.J.Liebermann,(1995) Introduction to Operations Research (6th Ed.) Mc Graw Hill.

3) Kantiswaroop, P.K.Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.

4) G.Hadley, Linear Programming, Narosa publishing House, 1995.

5) G.Hadley, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass.

6) H.A.Taha, Operations Research - An Introduction, Macmillan Publishing Company, Inc, New York.

7) S.S.Rao, Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.

8) P. K. Gupta and D. S. Hira, Operations Research – A Introduction. S. Chand & company Ltd, New Delhi.

9) N. S. Kambo, Mathematical Programming Techniques. Affiliated East-West Press Pvt. Ltd, New Delhi.

M.Sc. (STATISTICS)

Semester II

SEMESTER-II	
Paper No.	Name of the paper
STT 06	Probability Theory
STT 07	Linear Models and Regression Analysis
STT 08	Statistical Inference
STT 09	Multivariate Analysis
STT 10	Statistical Computing (programming)
STP 03	Practical-III (based on STT 08 and STT 09)
STP 04	Practical-IV (based on STT 07 and STT 10)

STT 06 PROBABILITY THEORY

(Maximum no of periods: 60)

Unit I: Axiomatic definition of Probability, Probability measure on a s-field, Probability space (definition only), Properties of probability measure. Independence of two events and n>2 events, mutual independence, Sequence of independent events, Independent classes of events, Borel- Cantelli Lemma, Random Variable, Expectation of random variable, Linear properties of expectation.

Unit II: Distribution functions and its properties, convergence of sequence of random variables, convergence almostsure, convergence in probability, convergence in distribution, convergence in r^{th} mean, inter relations between different types of convergences.

Unit III: Characteristic function, properties, inequalities, uniqueness theorem, Inversion theorem, continuity theorem.

Unit IV: Weak law of large numbers, Strong law of large numbers, Chebyshev's weak law of large numbers, Khinchin's weak law of large numbers, Kolmogorov's strong law of large numbers (statement only), Kolmogorov's inequality.

Unit V: Central Limit Theorem, Demoivr's, Laplace, Lindeberg -Levy, Lindeberg - Feller (sufficiency only) and applications. Multivariate central limit theorem.

REFERENCES:

1) Vardhan S. R. S. (2000) Probability Theory, New York University.

2) Ash Robert (1972) Real analysis and probability, Academic press.

3) Mukhopadhy P. (2002) Theory of Probability, New central book agency, Calcutta.

4) Bhat B. R. (2000) Modern Probability Theory, New age international.

5) Billingsley P. P. (1986) probability and measure, Wiley.

6) Dudewicz E. J. and Mishra S. N. (1988) Modern Mathematical statistics, Wiley Int. student's Edition.

7) RohatgiV. K. (1984) An introduction to probability theory and Mathematical Statistics, Wiley Eastern.

STT 07 **LINEAR MODELS AND REGRESSION ANALYSIS**

(Maximum no. of periods: 60)

UNIT I: General Linear Model: Definition, assumption, concept of estimability, Least square estimation, Best Linear Unbiased Estimator (BLUE). Error space, Gauss- Markov theorem, Estimation of error Variances.

UNIT II: ANOVA: One way and Two way classification without and with Interaction with equal number of cell. Basic designs–CRD, RBD, LSD and their analyses, Missing plot techniques in RBD and LSD with one missing and two missing value. Estimation and related test of hypothesis, Tukey's test of additivity. Multiple comparison test due to Tukey and Scheffe.

UNIT III: Simple linear regression, multiple regression, polynomials regression, orthogonal polynomials. Residuals and their plots as tests for departure from assumptions such as fitness of the model, normally, homogeneity of variance and detection of outliers, Remedies.

UNIT IV: Multicolliearity, Ridge regression, Robust regression, principal components regression, subset selection of explanatory variables, Mallow's Cp Statistics.

UNIT V: Non-linear regression models, Least squares estimation in nonlinear regression, model building and diagnostics, Logistic regression.

REFERENCES:

1) Joshi D.D. (1987) Linear Estimation and design and analysis of experiments, Wiley Eastern.
2) Giri N (1986) Analysis of variance, South Asia Publishers.
3) Cook R.D. And Weisberg S. (1982) Residual and influence in Regression, Chapman and Hall.
4) Draper N.R.and Smity, H (1998) applied Regression analysis, 3rd ed. Wiley.
5) Rao. C.R. (2002) Linear Statistical Inference and its Applications, 2nd Ed. Wiley.
6) Weisberg S. (1985) Applied Linear Regression, Wiley.
7) Montegomery D.C., Peck, E.A. and Vining G.G.(2003). Introduction to Linear Regression Analysis,3rd Ed. Wiley.
8) Ratkowsky, D. A.(1983) Nonlinear regression modeling, Marcel Dekker.
9) Kutner, Neter, Nachtsheim and Wasserman (2003) Applied Linear Regression, 4th Ed., McGraw-Hill.

STT 08 **STATISTICAL INFERENCE**

(Maximum no of periods: 60)

UNIT I: Introduction of Parametric models, Point estimation, Tests of hypotheses and Interval estimation. Joint distribution of a sample and sampling distribution of a Statistic. Likelihood function; examples from standard discrete and continuous models .

UNIT II: Information in data about the parameters and variation in likelihood function, concept of no information. Sufficiency, Fisher's concept of sufficiency, Sufficient Statistic, Neyman Factorizability criterion, Likelihood equivalence, Minimal sufficient Statistic. Invariance property of sufficiency under one-one transformation of sample space. Exponential families and Pitman families. Fisher information for one and several parameters models.

UNIT III: Maximum Likelihood methods, Methods of moments and percentiles. UMVUE, Rao- Blackwell Theorem. Completeness property of family of distributions. Lehmann-Scheffe theorem, Rao-Blackwell theorem and its applications. Necessary and sufficient condition for UMVUE. Cramer-Rao lower bound approach.

UNIT IV: Tests of Hypotheses: Concepts of critical regions. Test functions.Two kinds of errors, Size function, Power function, Level of the test. Introduction of null and alternative hypotheses with examples. Most powerful (MP) and Uniformly Most Powerful (UMP) test in the class of size α tests. Neyman-Pearson Lemma, MP test for simple null against simple alternative hypothesis. UMP tests for simple null hypothesis against one-sided alternatives and for one-sided null against one-sided alternatives in one parameter exponential family. Extensions of these results of Pitman family when only upper or lower end depends on the parameter. MLR property and extension of the above results to the distributions with MLR property. Non-existence of UMP test for simple null against two sided alternatives in one parameter exponential family.

UNIT V: Interval Estimation: Confidence level, construction of confidence intervals using pivots, Shortest expected length confidence interval. Uniformly most accurate one-sided confidence interval and its relation to UMP test for one-sided null against one-sided alternative hypotheses.

REFERENCES:

1) Kale B.K. (1999) A First course on Parametric Inference, Narosa.

2) Casella G. & Beregar R.L.(2002) Statistical Inference, 2nd edition, Duxbury Advanced series.

3) Ferguson T.S (1996): A course on large sample Theory, Chapman and Hall.

4) Dudewitz E.J. & Mishra S.N.(1988) Modern mathematical Statistics, JohnWiley.

5) Lehman E.L. (1988) Theory of point estimation, John Wiley.

6) Lehman E.L. (1986) Testing of statistical hypotheses, John Wiley.

7) Rohatgi V.K and Saleh A.K. Md. E (2001) Introduction to Probability Theory and Mathematical Statistics, John –Wiley and Sons.

8) Rao C. R.(1973) Linear Statistical Inference & its Applications, 2nd Ed., Wiley.

9) George Casella, Roger L. Berger (2001) Statistical Inference,2nd Ed., Duxbury press.

10) Zacks S. (1971) Theory of Statistical Inference John Wiley and Sons, New York.

STT 09 **MULTIVARIATE ANALYSIS**

(Maximum no. of periods: 60)

UNIT I: Multivariate normal distribution, marginal and conditional distribution, singular and nonsingular normal distribution, Characteristic function, Maximum likelihood estimators of the mean vector and covariance matrix.

UNIT II: Wishart Distribution: Wishart matrix- its distribution and properties, Distribution of sample generalized variance.

UNIT III: Hotelling's T^2 statistics and its distribution. Application T^2 Statistics and its relationship with Mahalanobis D^2 Statistics.

UNIT IV: Classification and discrimination procedures for discrimination between two multivariate normal populations – sample discriminant function, probabilities of misclassification and their estimation.

UNIT V: Principal components, Dimension reduction, Canonical variables and canonical correlation – definition, use, estimation and computation. Multivariate Analysis of Variance (MANOVA) of one and two–way classified data.

REFERENCES:

1) Anderson T.W. (1983) An Introduction to Multivariate Statistical Analysis, 2nd Ed. Wiley.

2) Giri N.C. (1977) Multivariate Statistical Inference, Academic press.

3) Kshirsagar A.M. (1972) Multivariate Analysis, Marcel Dekker.

4) Morrison D.F. (1976) Mathematical Statistics Methods, 2nd Ed Mc-Graw Hill.

5) Rao.C.R.(2002) Linear Statistical Inference and Its Application 2nd Ed. Wiley.

6) Seber G. A. F. (1984) Multivariate observations Wiley.

7) Sharma S. (1996) Applied multivariate techniques Wiley.

8) Srivastava S. and Khatri C.G. (1979) An introduction to Multivariate Statistics, North Holland.

9) Johnson and Wichern (1992) Applied multivariate Statistical Analysis, Prentice Hall 3rd Ed.

10) Roy S.N.(1987) Some Aspects of Multivariate Analysis John Wiley.

11) Muirhead, R.J. (1982). Aspects of Multivariate Statistical Theory, J. Wiley.

12) Bhuyan K.C. (2005) Multivariate Analysis and its application, New Central book age., Ltd. Kolkatta.

STT 10 **STATISTICAL COMPUTING**

(Maximum no of periods: 60)

UNIT I: Introduction: History of R programming, starting and ending R, R commands, Data types, Getting help in R, R use as calculator.

UNIT II: Descriptive Statistics: Diagrammatic representation of data, measures of central tendency, measures of dispersion, measures of skewness and kurtosis.

UNIT III: Probability and probability distributions: problems on finding basic probabilities, some special discrete distributions, continuous probability distributions.

UNIT IV: Statistical inference: Sampling distribution of sample mean, estimation of parameters, hypothesis testing, goodness of fit tests.

UNIT V: Correlation, inference procedure for correlation coefficient, linear regression and its inference procedure.

REFRENCES

1) Normal Maltoff (2009) The art of R programming.

2) Purohit S. G., Gore S. D. and Deshmukh S. K. (2010) Statistics using R, Narosa.

3) W. John Braun, John Braun, Duncan James Murdoch(2007) First Course in Statistical Programming with R, Cambridge University Press.

4) M. D. Ugarte, A. F. Militino, A. T. Arnholt (2008) Probability and Statistics with R, CRC Press.

5) Peter Dalgaard (2008) Introductory Statistics with R, Springer.

6) Michael J. Crawley (2007) The R Book, John Wiley and Sons.