Annexure-2.

M.SC. IN APPLIED STATISTICS
COURSE STRUCTURE FOR 2012-13 ONWARDS

SEMESTER-I

MAS 101	:	Advanced Analysis & Linear Algebra	(3 Credits)
MAS 102	:	Probability and Distribution theory	(4 Credits)
MAS 103	:	Sampling Techniques	(4 Credits)
MAS 104	:	Official Statistics	(3 Credits)
MAS 105	:	Lab	(2 Credits)

SEMESTER-II

MAS 201	:	Measure Theory and Advanced Probability	(4 Credits)
MAS 202	:	Linear Regression Analysis & Time Series	(4 Credits)
MAS 203	:	Multivariate Analysis	(3 Credits)
MAS 204	:	Stochastic Process	(3 Credits)
MAS 205	:	Lab	(2 Credits)

SEMESTER-III

MAS 301	:	Statistical Inference	(4 Credits)
MAS 302	:	Design of Experiments	(3 Credits)
MAS 303	:	Reliability Theory & Statistical Quality Control	(4 Credits)
MAS 304	:	Econometrics	(3 Credits)
MAS 305	:	Lab	(2 Credits)

SEMESTER-IV

MAS 401	:	Sequential and Bayesian Analysis	(4 Credits)
MAS 402	:	Demography & Vital Statistics	(3 Credits)
MAS 403	:	Operation Research and Non Parametric Inference	(4 Credits)
MAS 404	:	Project Work and Dissertation	(3 Credits)
MAS 405	:	Lab	(2 Credits)

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M.SC. IN APPLIED STATISTICS- SEMESTER-I

MAS 101 : ADVANCE ANALYSIS AND LINEAR ALGEBRA: (3 credits)

Recap of elements of set theory; Introduction to real number, open and closed intervals (rectangles), compact sets, Bolzano-Weirstrass theorem.

Sequences and series and their convergence. Real valued functions, continuous functions, Uniform continuity, sequences of functions, uniform convergence.

Complex numbers, Analytic function, Cauchy fundamental theorem, Cauchy integral theorem, Contour integrations.

Field, vector spaces, sub-spaces, linear dependence and independence, basis and dimension of a vector space, orthogonalization process, orthonormal basis.

Linear transformation, Algebra of matrices, row and column spaces of a matrix, determinants, rank and inverse of a matrix, solution of matrix equations. Real quadratic forms, index and signature, reduction and classification of quadratic forms. Characteristic roots, Caley-Hamilton theorem.

REFERENCES

Apostol, T.M. (1985): Mathematical Analysis, Narosa, Indian Ed.

Courant, R. and John, F. (1965): Introduction to Calculus and Analysis, Wiley.

Miller, K.S. (1957): Advanced Real Calculus, Harper, New York.

Rudin, Walter (1976): Principles of Mathematical Analysis, McGraw Hill.

Shanti Narain: A course in mathematical Analysis, S.Chand and company.

Shanti Narain: A textbook of matrices, S.Chand and Company.

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MAS 102 : PROBABILITY AND DISTRIBUTION THEORY: (4 credits)

Brief review of basic distribution theory, joint, marginal, conditional pmf's and pdf's, standard discrete and continuous distributions, bivariate normal, bivariate exponential and multinomial distributions, functions of random variables and transformation of random variables.

Compound, truncated and mixture distributions, conditional expectation, multiple and partial correlations, linear and multiple regressions. Markov, Holder, Jensen, Liapunov inequalities.

Sampling distributions, non-central Chi-square, t and F distributions and their properties. Distributions of quadratic forms under normality and related distribution theory.

Order statistics, their distributions and properties, joint and marginal distributions of order statistics, distribution of median and range, extreme values and their asymptotic distributions (statement only) with applications.

REFERENCES

Dudewicz, E.J. and Mishra, S.N. (1988): Modern Mathematical Statistics, Wiley, Int'l Students' Edition.

Rohatgi, V.K. (1984): An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

Rao C.R. (1973): Linear Statistical Inference and its Applications, John Wiley & Sons.

Pitman, J. (1983): Probability, Narosa Publishing House.

Johnson, N. L., Kotz, S. and Balakrishnan, N. (2003): Continuous/Discrete Univariate Distributions in Statistics, Vol. I, II and III, John Wiley & Sons, 2004.

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

David, H. A and Nagaraja H.N. : Order Statistics, John Wiley & Sons, 2004

MAS 103 : SAMPLEING TECHNIQUES: (4 credits)

Review of SRSWR/WOR, Ratio and regression method of estimation. Unequal probability sampling: PPSWR/WOR methods (including Lahiri's scheme) and related estimators of a finite population mean. Hansen-Hurwitz and Desraj estimators for general sample size and Murthy's estimator for a sample of size 2.

Horvitz-Thompson estimator, its variance and unbiased estimator of variance, IPPS schemes of sampling due to Midzuno-Sen, Rao-Hartley-Cochran and Samphord.

The Jackknife and Bootstrap: estimate of bias, estimate of variance. Ratio Estimation in reference to Jackknife and bootstraps, Relationship between the jackknife and the bootstrap. Interpenetrating sub sampling.

Non-sampling errors. Randomized Response techniques (Warner's method: related and unrelated questionnaire methods).

REFERENCES

Chaudhuri, A. and Mukerjee, R. (1988): Randomized Response: Theory and Techniques, New York: Marcel Dekker Inc.

Cochran, W.G.: Sampling Techniques (3rd Edition, 1977). Wiley.

Des Raj and Chandok (1998): Sampling Theory, Narosa.

Murthy, M. N. (1977): Sampling Theory & Methods, Statistical Publishing Society, Calcutta.

Sukhatme et al (1984): Sampling Theory of Surveys with Applications. Iowa state University Press & IARS.

Singh, D. and Chaudhary, F.S. (1986): Theory and Analysis of Sample Survey Designs. New Age International Publishers.

Gray, H.L., and Schucany(1972) : The generalized jackknife statistic. New York. Marcel Dekker, Inc.

MAS 104 : OFFICIAL STATISTICS: (3 credits)

Introduction to Indian and International statistical systems. Role, function and activities of Central and State statistical organizations. Organization of large scale sample surveys. Role of National Sample Survey Organization.

Population growth in developed and developing countries, evaluation of performance of family welfare programmes, projections of labour force and manpower. Scope and content of population census of India.

System of collection of Agricultural Statistics. Crop forecasting and estimation, productivity, fragmentation of holdings, support prices, buffer stocks, impact of irrigation projects.

Statistics related to industries, foreign trade, balance of payment, cost of living, inflation, educational and other social statistics.

REFERENCES

Basic Statistics Relating to the Indian Economy (CSO) 1990.

Guide to Official Statistics (CSO) 1999.

Statistical System in India (CSO) 1995.

Principles and accommodation of National Population Censuses, UNESCO.

Panse, V. G., Estimation of Crop Yields (FAO).

Family Welfare Yearbook. Annual Publication of D/o Family Welfare.

Monthly Statistics of Foreign Trade in India, DGCIS, Calcutta and other Govt. Publications.

MAS 105 : LAB (2 credits): PRACTICALS BASED ON THEORY PAPERS

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M.SC. IN APPLIED STATISTICS- SEMESTER-II

MAS 201 : PROBABILITY-II (4 credits)

Classes of sets. fields, sigma field, minimal sigma field. Borel sigma field, sequence of sets. Measure, Probability measure, Properties of measure. Lebseque measure, Lebesgue-Stieljes measure, Measurable functions and properties. Integral with respect to a measure and monotone convergence theorem, Fatou's Lemma and dominated convergence theorems, Fubini Theorem (without proof).

Sequence of random variables, convergence in distribution, convergence in probability, convergence in r-th mean, almost sure convergence. Interrelationship among different modes of convergences.

Weak law of large numbers – Bernoulli and Khintchine's WLLNs. Strong law of large numbers. Kolmogorov inequality, Kolmogorov's SLLNs for independent random variables; Statement of Kolmogorov's SLLNs for i.i.d random variables. Central Limit Theorem – Levy-Lindeberg form, Liapunov's form, Borel centelli lemma and Borel zero–one law.

Characteristic function, uniqueness theorem, Inversion theorem, Levy's continuity theorem, CLT for a sequence of independent random variables under Lindeberg's condition, CLT for iid random variables.

REFERENCES

Ash, Robert (1972): Real analysis and Probability, Academic Press.

Billingsley, P. (1986): Probability and Measure, Wiley.

Dudley, R.M. (1989): Real Analysis and Probability, Wadsworth and Brooks/Cole.

Kingman, J.F.C. and Taylor, S.J. (1966): Introduction to Measure and Probability, Cambridge University Press.

Chow, Y.S. & Teicher, H. (1979): Probability Theory, Narosa Publishing House, New Delhi

Bhat, B.R. (1985): Modern Probability Theory, Wiley Eastern Limited.

Rohatgi, V.K. (1984): An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

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MAS 202:LINEAR REGRESSION ANALYSIS ANDTIME SERIES:(4 credits)

Generalized inverse, Moore-Penrose generalized inverse. Important results on g-inverse, Use of generalized inverse of matrices.

Linear models of full rank and not of full rank, Normal equations and least squares estimates, BLUE, Gauss-Markov Theorem, Error and estimation spaces, variance and covariances of least squares estimates, estimation of error variance.

Models containing function of the predictors, including polynominal models, Use of orthogonal models, Hypotheses for one and more than one linear parametric functions, Confidence regions, Analysis of Variance, Power of F-test. Multiple comparison tests due to Tukey and Scheffe, Simultaneous confidence intervals.

Time-Series as discrete parameter stochastic process. Auto covariance and autocorrelation functions and their properties. Exploratory time series analysis, tests for trend and seasonality. Exponential and moving average smoothing, Holt and winters smoothing. Forecasting based on smoothing, adaptive smoothing.

REFERENCES

Cook, R.D. and Weisberg, S. (1982): Residual and Influence in Regression. Chapman and Hall.

Draper, N.R.and Smith, H. (1998): Applied Regression Analysis, Third Edition Wiley.

Guest, R.F. and Mason, R.L. (1980): Regression analysis and its Applications - A Data Oriented Approach. Marcel and Dekker.

Rao, C.R. (1973): Linear statistical inference and its Applications. Wiley Eastern.

Weisberg, S. (1985): Applied Linear Regression. Wiley.

Anderson, T.W. (1971). The Statistical Analysis of Time Series, John Wiley, New York.

Box, G.E.P. and Jenkins, G.M. (1976). Time Series Analysis- Forecasting and Control, Holden-day, San Francisco.

Kendall, Sir Maurice and Ord, J.K. (1990), Time Series, Edward Arnold, London.

Fuller, W.A. (1976). Introduction to Statistical Time Series, John Wiley, New York.

Montgomery, D.C. and Johnson, L.A. (1977) Forecasting and Time Series Analysis, McGraw Hill, New, York.

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MAS 203 : MULTIVARIATE ANALYSIS:(3 credits)

Properties of multivariate distributions, characteristic functions and moments. Bivariate normal and Multivariate normal. Wishart matrix - its distribution and properties, Distribution of sample generalized variance, Null and non-null distribution of simple correlation coefficient. Application in testing and interval estimation.

Null distribution of Hotelling's T^2 statistic, Application in tests on mean vector for one and more multivariate normal populations and also on equality of the components of a mean vector in a multivariate normal population, Fisher Behren Problem.

Classification and discrimination procedures for discrimination between two multivariate normal populations-sample discriminant function, test associated with discriminant functions, probabilities of misclassification and their estimation, classification into more than two multivariate normal populations.

Multivariate Analysis of variance (MANOVA) for one way classified data only, Principal components, dimension reduction, Canonical variables and canonical correlations: definition, use, estimation and computation.

REFERENCES

Anderson T.W. (1983): An Introduction to Multivariate Statistical Analysis (Second Edition) Wiley.

Giri, N.C. (1977): Multivariate Statistical Inference. Academic Press.

Khsirsagar A.M. (1972): Multivariate analysis. Marcel Dekker.

Morrison, D.F. (1976): Multivariate Statistical methods. 2nd. Ed. McGraw Hill.

Muirhead, R.J. (1982) Aspects of multivariate statistical theory, J.Willey.

Rao C.R. (1973): Linear Statistical Inference and its Applications 2nd. Ed. Wiley.

Seber, G.A.F. (1984): Multivariate observations. Wiley

Sharma, S. (1996): Applied multivariate techniques. Wiley.

Srivastava M.S. & Khatri C.G. (1979): An Introduction to Multivariate Statistics. North Holland.

Johnson, R. and Wychern (1992): Applied multivariate Statistical analysis, prentice-Hall, 3rd. Ed.

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MAS 204 : STOCHASTIC PROCESSES: (3 credits)

Introduction to stochastic processes (sp's): Classification of sp's according to state space and time domain, Countable state. Markov chains (MC's), Chapman-Kolmogorov equations, calculation of n-step transition probability and its limit, Stationary distribution, classification of states, transient MC, random walk and gambler's ruin problem.

Discrete state space continuous time, Markov Chains: Kolmogorov-Feller differential equations. Poisson process, birth and death process, application to queues and storage problems,

Renewal theory: Elementary renewal theorem and applications, Statement and uses of key renewal theorem, study of residual life time process, Stationary process, weakly stationary and strongly stationary process.

Branching process: Galton-Watson branching process, probability of ultimate extinction, distribution of population size, Martingale in discrete time, inequality, convergence and smoothing properties.

REFERENCES

Adke, S.R. and Munjunath, S.M. (1984): An Introduction to Finite Markov Processes, Wiley Eastern.

Bhat, B.R. (2000): Stochastic Models: Analysis and Applications, New Age International, India.

Cinlar, E. (1975): Introduction to Stochastic Process, Prentice Hall.

Feller, W. (1968): Introduction to probability and its Applications, Vol.1, Wiley Eastern.

Harris, T.E. (1963): The Theory of Branching Processes, Springer - Verlag.

Hoel, P.G. Port, S.C. and stone, C.J. (1972): Introduction to Stochastic Process, Houghton Miffin & Co.

Karlin, S. and Taylor H.M. (1975): A First course in stochastic processes, Vol. I Academic press.

Medhi, J. (1982): Stochastic Processes, Wiley Eastern.

Parzen E. (1962): Stochastic Processes. Holden –Day.

MAS 205 : LAB(2 credits): PRACTICALS BASED ON THEORY PAPERS

M.SC. IN APPLIED STATISTICS- SEMESTER-III

MAS 301 : STATISTICAL INFERENCE (4 credits)

Properties of good estimators, Unbiasedness, Consistency, Efficiency, Sufficiency Minimal sufficient statistics and Completeness. Cramer-Rao bounds, Bhattacharya bounds. Minimum variance unbiased estimators, Rao-Blackwell Theorem. Lehman-Scheffe theorem and their applications.

Method of Estimation, Method of Maximum Likelihood, Method of Moments, Method of Chi-Square, properties of M.L.E. Location Invariance, scale invariance. Pitmann's estimators for location and scale parameters.

Non-randomized and randomized tests. Size, power functions. unbiasedness. NP-Lemma and its applications in construction of MP tests for simple null hypotheses. MLR families.

UMP tests for one sided null hypotheses against one-sided composite alternative. Generalized NP lemma, Locally best test, UMPU tests, Similar tests, Neyman structure, UMPU tests against one-sided and two-sided alternatives, Confidence set estimation, Relation with hypothesis testing, optimum parametric confidence sets.

REFERENCES

Kale, B. K.(1999) : A first course on parametric inference, Narosa Publishing House.

Rohatagi, V. (1988): An Introduction to probability and mathematical Statistics. John Wiley and Sons

Lehmann, E.L.(1986) : Theory of point. Estimation, John Wiley and Sons

Lehmann, E.L.(1986) : Testing Statistical Hypotheses, John Wiley and Sons

Rao, C.R. (1973): Linear Statistical inference, John Wiley and Sons

Dudewicz, E.J. and Mishra, S.N. (1988): Modern Mathematical Statistics. Wiley Series in Prob. Math. Stat., John Wiley and sons, New York.

Zacks, S. (1971): Theory of statistical Inference, John Wiley & Sons, New York.

MAS 302 : DESIGN OF EXPERIMENTS (3 credits)

Analysis of experimental model by least square, Cochran's theorem. Analysis of variance and covariance. Transformations.

Principles of design of experiments, uniformity trails, randomized experiments, completely randomized design, randomized block design, Latin square design .

Factorial Experiment 2^n and 3^2, total and partial confounding. Construction of confounded factorial experiments belonging to 2^n series.

Analysis of non orthogonal data, analysis of missing plot and mixed plot data.

Split plot and strip plot designs. Balanced incomplete block design (intra - block analysis).

General theory of analysis of experimental designs. Desirable properties of a good design: orthogonality, connectedness and balancing. Balanced Incomplete Block Design (BIBD) Constructions of symmetrical fractional factorial experiments.

REFERENCES

Fedrer, W.T. (1975): Experimental Design - Theory and Application , Oxford & IBH.

Raghava Rao D. (1971): Construction and Combinatorial problems in Design of experiment. Wiley

Kempthorne, O.(1979): The Design and Analysis of Experiments, John Wiley Publications.

Aloke Dey (1986): Theory of Block Designs, Wiley Eastern.

Cocharan ,W.G. and Cox,G.M.(1950): Experimental Design, Wiley;Chapman & Hall.

Angela Dean and Daniel Voss (1999): Design and Analysis of Experiments, Springer.

Das, M.N. & Giri, N.(1979): Design and Analysis of experiments, Wiley Eastern.

Giri, N. (1986): Analysis of Variance, South Asian Publishers.

John P.W.M. (1971): Statistical design and analysis of experiments, Mc Millan.

Joshi, D.D. (1987): Linear Estimation and Design of Experiments, Wiley Eastern.

Montgomery, C.D. (1976): Design and analysis of experiments, Wiley, New York.

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MAS 303 : RELIABILITY THEORY & STATISTICAL QUALITY CONTROL (4 credits)

Definition of Reliability, Maintainability and Availability, Life distributions, failure rates and bath tub failure curve, Exponential, Gamma, Weibull and log Normal models, Linearly increasing Hazard model, mean time to system failure and mean time between failure components and system reliability.

Different types of redundancy and use of redundancy in reliability improvement, Problem of life testing, censored and truncated experiments for exponential models.

General theory and review of control charts for variables and attributes, acceptance sampling for attributes inspection, single and double sampling plans and their properties.

Introduction to 6- Sigma limits, sequential sampling plan and its properties.

REFERENCES

Barlow R E and Proschen F (1985): Statistical Theory of Reliability and Life Testing, Holt, Rinchart and Winston.

Lawless J F (1982): Statistical models and methods of Life Time Data. John Wiley.

Bain L J and Engelhardt (1991): Statistical Analysis of Reliability and life testing models. Marcel Dekker.

Cowden, D.J.: Statistical Methods in Quality Control , Prentice Hall, 1957, and Asia Publishing House, 1960.

Dodge, H.F. and Roming, H.G. Sampling Inspection Tables, John Wiley, 1959.

Duncan, A.J: Quality Control and Industrial Statistics, Richard D. Irwin, 1953.

Ekanbaram, S.K.: The Statistical Basic of Quality Control Charts, Asia Publishing House, 1960.

Grant, E.L.: Statistical Quality Control, McGraw-Hill, 1964.

MAS 304 : ECONOMETRICS (3 credits)

Meaning and scope of econometrics. Concepts of dummy variables and proxy variable.
Problems and methods of estimation in single equation regression Models
Multicollinearity: Consequences of multicollinearity, tests to detect its presence and solutions to the problem of multicollinearity.

Heteroscedasticity: Consequences of hetroscedastic disturbances – test to detect its presence and solutions to the problem of heteroscedasticity.
Auto Correlation: Consequences of auto correlated disturbances, Durbin – Watson test – Estimation of autocorrelation coefficient (for a first order autoregressive scheme)

Simulation equation models and methods of estimation–Exogenous and Endogenous variables .
Problem of identification – Rank and order conditions and their application.
Methods of estimation: Indirect least squares. Two stages least squares, three stages least squares, Generalised Least Squares.

REFERENCES

Apte P.G. (1990): Text book of Econometrics. Tata McGraw Hill.

Cramer , J.S. (1971) : Empirical Econometrics, North Holland.

Gujarathi D. (1979): Basic Econometrics, McGraw hill.

Johnston, J (1984): Econometric methods, 3rd Ed. Mc Graw Hill.

Koutsoyiannis, A (1979): Theory of Econometrics, Macmillan Press.

Malinvaud, E (1966): Statistical methods of Econometrics, North Holland.

Theil, H. (1982): Introduction to the theory and practice of Econometrics, john Wiley.

Walters, A (1970): An introduction to Econometrics, McMillan & Co.

Watherill, G.B. (1986): Regression analysis with applications, Chapman Hall.

MAS 305 : LAB(2 credits): PRACTICALS BASED ON THEORY PAPERS

M.SC. IN APPLIED STATISTICS- SEMESTER-IV

MAS 401 : SEQUENTIAL AND BAYESIAN ANALYSIS (4 credits)

Sequential Analysis: Need of Sequential probability Ratio test and it's properties, Wald's fundamental identity, OC and ASN function, Optimality of SPRT. Applications to Normal, Binomial and Poisson Distribution. Sequential estimation – Basic idea, Stein's two stage procedure.

General structure of a Bayesian decision problem, role of loss function, Risk function, Prior information, application of Bayes theorem in computing posterior distributions, Bayes estimators of the posterior mean under squared error loss, Bayesian notion of sufficiency, construction of conjugate priors, improper and diffuse priors.

REFERENCES

Cox, D.R. and Oakes, D. (1984) : Analysis of Survival Data, Chapman and Hall, New York.

Gross A.J. and Clark, V.A. (1975) : Survival Distribution : Reliability applications in the Biomedical Sciences, John Wiley and Sons.

Elandt - Johnson, R.E. Johnson N.L. : Survival Models and Data Analysis, John Wiley and Sons.

Miller, R.G. (1981) : Survival Analysis (John Wiley).

Kalbfleisch J.D. and Prentice R.L. (1980), The Statistical Analysis of Failure Time Data, John Wiley.

Winkler: Introduction to Bayesian Inference.

Lindley: Introduction to Probability and Statistical Inference from Bayesian Viewpoint.

S.K. Sinha: Bayesian Statistics, Wiley Eastern.

MAS 402 : DEMOGRAPHY AND VITAL STATISTICS (3 Credits)

Coverage and content of errors in demographic data, Chandrasekharan- Deming formula to check completeness of registration data, adjustment of age data.

Measures of fertility, stochastic models for reproduction, distributions of time of birth, inter-live birth intervals and of number of births,

Measures of mortality, construction of abridged life tables, infant mortality rate and its adjustments, model life table. Stable and quasi stable populations, intrinsic growth rate. Models of population growth and their filling to population data.

Internal migration and its measurement, migration models, concept of internal migration. Methods for population projection, component method of population projection, Nuptiality and its measurement.

REFERENCES

Kumar, R. (1986): Technical Demography. Wiley Eastern Ltd.

Benjamin, B. (1969): Demographic Analysis, George , Allen and Unwin.

Cox , P. R. (1970): Demography. Cambridge University Press.

Wolfenden, H. H. (1954): Population Statistics and their compilation, Am actuarial society.

MAS 403: OPERATIONS RESEARCH AND NON PARAMETRIC INFERENCE (4 Credits)

Introduction: Definition and scope of operations research, Different types of models used in OR. Various phases of OR.

Allocation Problems: Mathematical formulation of L.P.P, Graphical method to solve a L.P.P, Convex set, Convex combination and extreme points. Simplex method to solve a L.P.P with slack, Surplus and Artificial variables. Construction of dual of a L.P.P.

Transportation Problem: Mathematical formulation of a transportation problem, Northwest corner rule, unit cost penalty method and method of matrix minima. Optimality test, Unbalanced transportation problem, Degeneracy in transportation problems.
Assignment Problems: Assignment problems, formulation of these problems and their solutions, Unbalanced Assignment problems.

Non-Parametric Inference : Test for Randomness, Test based on Runs & Sign for one & two samples problems, Median test, Wilcoxon and Mann-Whitney tests. Kolmogorov-Smrinov test for one and two samples.

REFERENCES

Swarup Kanti, Gupta P.K. and Man Mohan: Operations Research, Sultan Chand & Sons.

Gass, S. I. (1975) Linear Programming: Method and Application, Mc Graw – Hill, New York.

Shevoy, G. V. (1992), Linear Programming: Methods and Applications, Wiley Eastern, New Delhi.
Taha, H.A.: Operations Research, Mac Millan publishing

Gibbons, J.D. (2003): Nonparametric Statistical Inference, 4-th Edition, Marcel Dekker.

Randles, R.H. and Wolfe, D.A. (1979): Introduction to the Theory of Nonparametric Statistics,
Wiley.

Rohatgi, V.K. and Saleh, A.K.MD. Ehsanes (2005): An Introduction to Probability and Statistics (Chapter 13), 2-nd Edition, Wiley.

MAS 404 : PROJECT WORK AND DISSERTATION (3 Credits)

MAS 405 : LAB: PRACTICALS BASED ON THEORY PAPERS (2 Credits)