M.A./M.Sc. (STATISTICS)

MST-C-101:Measure Theory and Probability

Objectives: The objective of this paper is to acquaint students with basic concepts of probability and measure. The probability is used as a measure. This course has objective to give in depth knowledge of Set theory and measures such as field, Lebesuage and Stieltjes measure, Weak and strong law of large numbers for integration of measurable function, Markov independence, Central Limit Theorem etc.

Outcomes: After completion of this course, students will have good understanding of set theory and measures such as field, Lebesuage and Stieltjes measure, Weak and strong laws of large numbers, integration of measurable function, Markov independence, Central Limit Theorem etc.

UNIT I : Classes of sets. Fields, Sigma fields, minimal sigma-field, limit superior and limit inferior of a sequence. Measure, Properties of measure.

UNIT II: Lebesgue and Lebesgue- Stieljes measure. Measurable functions, random variable, sequence of random variables, almost sure convergence ,convergence in probability (and in measure).

UNIT III: Integration of measurable function with respect to a measure, Monotonic convergence theorem.

UNIT IV: Borel- Cantelli lemma, independence ,Weak and strong law of large numbers for i.i.d.sequence.Definition and example of Markov Independence.

UNIT V: Convergence in distribution, characteristics function, uniqueness theorem, Statement of Levy's continuity theorem,Central limit theorem for a sequence of independent variables.

BOOKS:

1. Billingsley P. (1986) : Probability and measure ,Wiley International.

2. Kingman JFC and SJ (1986): Introduction to measure theory and probability Taylor, Cambridge University,Press

3. Gupta ,K.P. ; Measure Theory

M.A./M.Sc. (STATISTICS)

MST-C-102 Distribution Theory

Objective: The objective of this course is to acquaint student with basic concepts of random variable and probability distributions, discrete as well as continuous. This course will cover various discrete distributions such as uniform, binomial, hyper geometric, Poisson and continuous distribution such as exponential, gamma, beta, Cauchy, normal distributions etc.

Outcomes: After completion of this course, student will have good understanding about basic concepts of random variable and probability distributions. After this course, students will have ability to understand discrete distributions such as uniform, binomial, hyper geometric, Poisson and continuous distribution such as exponential, gamma, beta, Cauchy, normal distributions etc. along with their applications.

UNIT I: Random Variables and its mathematical expectation ,conditional expectation ,joint marginal and conditional p.m.fs and p.d.fs.

UNIT II: Standard discrete distribution -the discrete Uniform distribution, Binomial, Truncated Binomial Hyper Geometric ,Possion ,Truncated Passion, Geometric and negative binomial distribution.

UNIT III: Continuous distribution –Continuous Uniform ,Exponential Gamma ,Beta and Cauchy distribution.

UNIT IV : Normal, Log normal , Laplace , Pareto ,Weibull and power series distribution .

UNIT V: Order Statistics- their distributions and properties,joint and marginal distribution of order statistics, Extreme values and their asymptotic distributions (Statement only).

BOOKS:

1.Dudewicz EJ and Mishra S.N. (1988) : Modern Mathematical Statistics International (Student Edn).

2. Rohatgi V.K. (1988) : An Introduction to probability Theory and mathematical statistics. Wiley Eastern.

3. Mukhopadhyay P. (1996) : Mathematical Statistics. New Central Book Agency.

(chairman BOS)

(member)

M.A./M.Sc. (STATISTICS)

MST-E-103 Linear Algebra

Objectives: The objective of this course is to acquaint student with basic concepts of linear Algebra. This course will cover fields, vector space, linear dependence, basis and dimension of vector space, orthogonal and ortho-normal basis and transformation, projective transformation, algebra of matrices, partitioned matrices, rank and inverse of a matrix, eigen values and eigen vectors, generalized inverse, quadratic forms and solution of system of linear equations.

Outcomes: After completion of this course, student will have good understanding about basic concepts of linear algebra. After this course, student will understand the various concepts such as fields, vector space, linear dependence, basis and dimension of vector space, orthogonal and orthonormal basis and transformation, projective transformation, algebra of matrices, partitioned matrices, rank and inverse of a matrix, eigen values and eigen vectors, generalized inverse, quadratic forms and solution of system of linear equations along with their applications.

UNIT 1:Vector Space : linear dependence ,basis and dimension of a vector space finite dimensional vector space.

UNIT II: Inner product spaces, orthogonal basis and Gram- Schmidt process of Orthogonalization, orthogonal projection of a vector, linear simultaneous equations – Cramer's rule.

UNIT III: Linear transformation and their properties, partitioned matrices, idempotent matrices, Kronecker product , Hadmard Product, Hermitecaconical form ,generalized inverse.

UNIT IV: Bilinear Forms ,Equivelance of bilinear forms, quadratic forms, reduction of quadratic forms orthogonal reduction ,index and signature of a quadratic form.

UNIT V: Eigen Values,Eigen Vectors and the characteristic equations of a matrix. Eigen value and Eigen Vectors of a linear transformation .Caley-Hamilton Theorem ,minimal polynomial, Multiplicity of Eigen Values, Hermitian matrices.

BOOKS:

1.Gray bill ,F.A.(1933) : Matrices with Application in Statistics. 2nd Ed.Wadsworth.

2.Searle,S.R.(1982) : Matrix Algebra Useful for Statistics. John Wiley and Sons

3.Datta,K.B.(2006) : Matrix and linear algebra. Prentice Hall of India EE.Edn.

4. Biswas,S.(1984) : Topics in Algebra of matrices.Academic Population.

5.Bellmen,R.(1970): Introduction to matrix analysis. 2nd Ed. Me Graw Hi

M.A./M.Sc. (STATISTICS)

MST-E-104 Real Analysis

Objectives: The objectives of this course are to give in depth knowledge to students about basic concepts of real analysis. It will cover real-valued function, continuous function, uniform continuity and convergence, power series, Fourier series , unconstrained and constrained optimization problems with several variables, double and multiple integrals, uniform convergence in improper integrals and differentiation under the sign of integral.

Outcomes: After completion of this course student will have in depth knowledge of basic concepts of real analysis. After this course, students will be able to understand various concepts such as real-valued function, continuous function, uniform continuity and convergence, power series, Fourier series , unconstrained and constrained optimization problems with several variables, double and multiple integrals, uniform convergence in improper integrals and differentiation under the sign of integral and their applications.

UNIT 1: Elements of set theory, introduction to real numbers, introduction to n dimensional Euclidian space, open and closed intervals, compact sets, Bolgano- weistrass and Heine Borel theorems.

UNIT 2: Sequence and series ,their convergence. Real valued function, continuous functions, uniform continuity.

UNIT 3 : Sequence of functions, uniform convergence .Power series and radius of convergence.

UNIT 4:Diffentiation, maxima-minima of functions, functions of several variables, constrained maxima minima functions.

UNIT 5: Multiple integrals and their evaluation by repeated integration ,change of variables in multiple integration ,uniform convergence in improper integrals a differentiation under the sign of integral Leibnitz rule.

BOOKS:

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

2.Rudin Waiter (1976) :Principales of Mathematical Analysis, McGraw Hills .

3.MalJik,S.c.Mathematical Analysis, Wiley Eastern Ltd.

(chairman BOS)

(member)

M.A./M.Sc. (STATISTICS)

MST-C- 201 Statistical inference-I

Objectives: The objective of the course is to impart in depth knowledge of theory of statistical inference. This course will give understanding to students about point estimation, Cramer –Rao inequality, Rao –Blackwell theorem, Lehman-Scheffe theorem, various methods of estimation and testing of hypothesis.

Outcomes: After completion of this course a student will be able to understand the basic concepts of estimation and statistical inference. After this course, students will have the knowledge of properties of estimators, methods of estimation of parameters, methods of obtaining minimum variance unbiased estimators. Further, students would be in position to evaluate the properties of the estimators and tests for both finite sample sizes and asymptotically sample size tends to infinity.

UNIT I: Point Estimation : Unbiasedness, Consistency, Sufficient conditions of consistent estimators, Efficiency, most efficient estimators, minimum variance unbiased estimators, Sufficiency, factorization theorem(discrete case only),properties of sufficient estimators, Minimal sufficient Statistics.

UNIT II: Cramer–Rao inequality, its alternative forms conditions for the equality, Rao –Blackwell theorem, completeness, complete family of distribution, Lehman-Scheffe theorem .

UNIT III: Methods of estimation: Method of maximum likelihood, properties of maximum likelihood estimators, method of moments Interval Estimation: confidence interval and confidence limits.

UNIT IV: Testing of hypothesis: Statistical hypothesis, Simple and composite, Error of first kind, critical region, level of significance, power of test ,UMP test, Neyman-Pearson lemma.

UNIT V: Likelihood Ratio Test, Properties of LR test, Application of LR test criterion , UMP test for simple null hypothesis against one sided alternatives, exponential family densities.

Books Recommended:

1. An outline of statistical theoty ,Vol 1 1- Goon,Gupta and Das Gupta
2. Fundamental of mathematical Statisatics – S.C. Gupta and V.K. Kapoor

(Chairman BOS)

(Member)

M.A./M.Sc. (STATISTICS)

MST-C- 202 Distribution Theory -II

Objectives: The objective of the course is to impart in depth knowledge of distribution theory. This course will give understanding to students about jointly distributed random variables, distribution function of joint distribution, Simple correlation and regression, non linear regression, regression of second kind, Sampling distribution of a function of a function of random variables, basic sampling distributions- Chi- Square, t and F distributions, Distribution arising from the bivariate normal etc.

Outcomes: After completion this course, students will have in depth knowledge of advance distribution theory including sampling distributions, non- central distributions and bivariate normal distribution. After this course, students will be in position apply distributions useful in drawing inference.

UNIT I: Jointly distributed random variables , distribution function of joint distribution, marginal distribution, conditional distribution and independence of X and Y. Discrete and continuous two dimensional distributions, moments of conditional distributions.

UNIT II: Simple correlation and regression ,non linear regression, regression of second kind, correlation index and correlation ratio, Bivariate normal distribution.

UNIT III: Sampling distribution of a function of a function of random variables, case of discrete and continuous variables, Three basic sampling distributions- Chi- Square,t and F distributions, sampling distribution arising from univariate normal distribution.

UNIT IV: Non Central Chi Square, T and F distribution, their properties and applications.

Unit V: Distribution arising from the bivariate normal, sampling distribution of sample mean, variance and covariance in bivariate normal situation.

BOOKS :

Gupta, S.C. Kapur ,V.K. Fundamental of mathematical statistics ,sultan Chand and Sons

Mukhopadhyay, P.: Mathematical Statistics,central Book Agency

(Chairman BOS)

(Member)

M.A./M.Sc. (STATISTICS)

MST-C- 203: SAMPLING TECHNIQUES

Objectives: The objective of the course is to inculcate the knowledge of sampling theory to students. This course would be useful in drawing the random samples using different sampling techniques. It will cover various sampling techniques such as simple random sampling, stratified random sampling, systematic sampling, cluster sampling, two-stage sampling, and probability proportional to size sampling etc.

Outcomes: After completion of this course, students would have in depth knowledge of sampling theory. After this course students would be able to draw the random samples using different sampling techniques. Students will be able to use various sampling techniques such as simple random sampling, stratified random sampling, systematic sampling, cluster sampling, two-stage sampling, and probability proportional to size sampling etc. for drawing the random samples as well as inferences.

UNIT I: Simple random sampling- definition ,notations, properties of the estimates, variance of the estimates f. p. c., estimate of the standard error from sample ,confidence limits.

Stratified random sampling –description notation, properties of the estimates ,estimated variancs and confidence limits ,optimum allocation, relative precision of stratified random sampling and simple random sampling.

Unit II: Stratified random sampling-estimation of sample size with continuous data, Stratified sampling for proportions, gain in precision in Stratified sampling for proportions. The ratio estimator, appoximate variance of the ratio estimate, estimation of the variance from a sample, confidence limits, bias of the ratio estimate, ratio estimate in Stratified sampling.

UNIT III: The linear regression estimate, regression estimate with pre assigned, regression estimate when b is computed from sample, sample estimate of variance, large sample comparison with the ratio estimate and the mean per unit, regression estimate in stratified sampling.

Systematic sampling- Description, variance of the estimated mean, comparison of systematic with stratified random sampling, populations in random order, population with linear trend, populations with periodic variations.

UNIT IV: Single stage cluster sampling: cluster of equal sizes-reasons for cluster sampling , variance in terms of intra cluster correlation. Sampling with probability proportional to size, selection with unequal probabilities. The Horvitz, Thomson estimator.

UNIT-V: Subsampling with units of equal size; Two-stage sampling, Finding Means and Variance in two stage sampling, variance of the estimated mean in two-stage sampling, sample estimation of the variance.

Double sampling: Description of the technique, double sampling for stratification, optimum allocation, estimated variance in double sampling for stratification.

(chairman BOS)

(member)

Books:

1.Cochran, W.G.: Sampling Techniques. Wiley Eastern.

2.Murthy, M.N. :Sampling Theory and Method. Statistical Publishing Society ,Calcutta.

M.A./M.Sc. (STATISTICS)

MST-E- DEMOGRAPHY

Objectives: The objective of the course is to inculcate the knowledge of demography in to students. This course would give deep understanding to students about mortality rates, fertility rates, life tables and various methods of population projection.

Outcomes: After completion of this course, students would have in depth knowledge of demography. After this course students would be able to calculate various types of mortality rates, fertility rates for different segments of the population. With the help of life tables students would understand to calculate life expectancy, probability of death at different ages which are useful in insurance and health sectors.

UNIT I : Census and Vital Statistics data ,Vital rates and ratio, standardization of rates, Measurement of mortality, standard death rate, Neo natal. Peri -natal and infant mortality rates ,causes of death rates, construction of life table and their uses, Abridge life tables.

UNIT II: Measures of fertility, period and cohort measure, use of birth order statistics, child women ratio, standard fertility rates, Gross and Net reproduction rates, length of generation, stationary and stable population.

UNIT IIII: Population estimation ,Logistic curve ,fitting of logistic curve by method of Pear, Reed and Rhode, Makehan's graduation formula and its fitting.

UNIT IV: Population projection and their matrix representation, method of solution, Migration and distribution of population.

UNIT V: Poisson Process, linear birth and death process, Birth, Death and migration model.

BOOKS:

1.Techniques of population analysis- Barclay,C.W.

2.Introduction to demography -Spieglaman

(Chairman BOS)

(Member)

M. A. / M. Sc. (Statistics)

MST-C-301: Statistical Inference-II

Objectives: The objective of the course is to impart the in-depth knowledge of non-conventional methods of statistical decision making such as decision theory, sequential analysis, non-parametric method for one and two sample problems.

Outcomes: After completion of this course a student will be able to draw inferences in different critical circumstances using decision theory, sequential analysis, and non-parametric method for one and two sample problems.

Unit-1: Elements of decision Theory- Some basic concepts, loss function; risk function, Minimax approach, Bayes approach; Point estimation as a decision problem, Hypothesis testing as a decision problem, interval estimation as a decision problem, Bayes and minimax estimators, Admissibility of estimators.

Unit-2: Sequential Analysis- Walds Sequential probability Ratio Test (SPRT), Determination of constants, Walds fundamental identity, OC function of SPRT, ASN function of SPRT.

Unit-3: Non-parametric methods- Parametric v/s non-parametric methods, order statistics and their distribution. Ranks, correlation between Ranks and variate values. Treatment of ties in ranks. Distribution of number of runs.

Unit-4: Test for one sample problems- Run test, Kolmogorov-Smirnov test, Sign test, Wilcoxon signed rank test.

Unit-5: Tests for two sample problems- Wald Wolfowitz Run test, Kolmogorov- Smirnov test, Median test, Wilcoxon test, Mann-Whitney test IJ-test.

BOOKS RECOMMENDED:

1. An outline of statistical theory, Vol.II-Goon Gupta and Das Gupta.
2. An introduction to probability theory and mathematical statistics –V. K. Rohtagi
3. Introduction to the theory of statistics- M.A. Mood, F.A. Graybill and D.C. noes.
4. Mathematical statistics- S.S. Wilks
5. Sequential Analysis- A. Wald.
6. Non-parametric Statistical Inference- J. D. Gibbons
7. Non-parametric Statistics for behavioural Sciences- S. Siegal

(chairman BOS)

(Member)

M. A. / M. Sc. (Statistics)

MST-C-302 : Multivariate Analysis

Objectives: The objective of the course is to impart the in-depth knowledge of statistical tools when data is available on large number of variables. Multivariate normal distribution, generalized T- square, Mahalanobis D-square, classification problems are some important statistical tools are to be covered.

Outcomes: After completion of this course a student will have good theoretical as well as practical knowledge of application of statistical tools such as multivariate normal distribution, generalized T- square, Mahalanobis D-square and classification problems.

Unit-1: The multivariate normal distribution, the distribution of linear combination of normally distributed variants; Independence of variates, marginal distribution, The multiple correlation coefficient, Some formulas for practical correlations, The characteristics function.

Unit-2: Estimation of the mean vector and the covariance matrix: The maximum likelihood estimates of the mean vector and the covariance matrix, The distribution of the sample mean vector; The Generalized T^2 – Statistics: Derivation of T^2 – Statistics as a function of the likelihood ratio criterion.

Unit-3: The distribution of T^2 , uses of T^2 –statistics, Mahalanobis D^2 – statistics, its distribution and uses, Wishart distribution, its derivation and properties.

Unit-4: Definition of Principal components in the population, Maximum likelihood estimates of the principal components and their variances, Canonical correlation and variates in the population.

Unit-5: The problem of classification, standards of good classification, procedure of classification into one of the two populations with known probability distributions, classification into one of the two known multivariate normal populations, Classification into one of the two multivariate normal population when the parameters are estimated.

BOOKS RECOMMENDED:

1. T.W. Anderson: An introduction to Multivariate Statistical Analysis, Wiley Eastern, Pvt. Ltd.

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(Member)

2.Kshirsagar: Multivariate Analysis

3.Khatri, e.G.: Multivariate Analysis

4. S. N. Roy: Some Aspects of Multivariate Analysis

M. A. / M. Sc. (Statistics)

MST-C-303:Operation Research

Objectives: The objective of the course is to educate students for building and applying mathematical and statistical models for real life problems faced in different situations. Methods to be covered in this course are linear programming, assignment problem, transportation problem, theory of games, job sequencing, PERT and CPM etc.

Outcomes: After completion of this course a student will have good knowledge about building and applying mathematical and statistical models for real life problems. After this course, students will be able to apply solution methods such as linear programming, assignment problem, transportation problem, theory of games, job sequencing, PERT and CPM etc. in real life situations.

Unit-1: Definition and scope of O.R., Linear Programming: Graphical solution of two variable problems, Formation of Linear programming (LPP), Slack and Surplus variables, standard and Matrix forms of LPP, important definitions, assumption of LPP, Simplex method of solution.

Unit-2: Two-phase simplex method, Big-M method, problem of degeneracy. Specia cases: Alternative solutions, unbounded solutions and non-existing solutions, Duality in LPP: Duality theorems: Fundamental duality theorem and existence theorems.

Unit-3: Assignment problem: Fundamental theorems, Hungarian method for assignment problems, unbiased assignment problems. Travelling salesmen problem. Transportation problem. Method for initial basic feasible solution, method for optimal solution, degeneracy in transportation problems.

Unit-4: Theory of games: Basic definitions minimax (maximine) criterion, saddle point, optimal strategies and the value of the game, solution of games with saddle point, minimax-maximum principle for mixed strategy game, 2x2 games without saddle point, principle of dominance graphical method for 2xn games.

Unit-5: Job Sequencing: Terminology and notations, processing n jobs through 2 machines, processing two jobs through m machines and n jobs through m machines. Project management by PERT-CPM: Basic steps in PERT/CPM techniques, Rules for drawing network diagram, time estimates and critical path in network analysis. Project evaluation and review technique (PERT): Optiministics, most likely, pessimistic and expected time (PERT).

BOOKS RECOMMENDED:

1. Sharma, S.D. – Operation Research, Kedarnath Ramnath & Co.

(chairman BOS)

(member)

2. Kantiswaroop, Gupta P. K. & Singh M. – Operation Research, sultan Chand and sons
3. Gass, S.I. –Linear Programming, 3/e Me Graw- Hill Kogakusha, Tokyo (1969)
4. Hardly, G.- Linear Programming, Addison Wesley, Reading Mass Masachusetts (1962)
5. Vohra, N.D.- Quantitative Techniques in Management, Tata Mc Grew Hil Pub. Co. New Delhi
6. Makinsey, J.c.c.- Introduction to game theory, Me Grew Hil

M. A. / M. Sc. (Statistics)

MST-C-304 :Programming with C language

Objectives: Objective of the course is to enable the students with basic knowledge of computer programming in 'C'. Main objective of the course is to make students able to create and run programmes and get solutions through programmes based on application of statistical tools.

Outcomes: After completion of this course, a student will have good knowledge about basic concepts of programming in 'C'. After this course , student will have ability to write programs useful in various statistical procedures.

Unit-1: Introduction and importance of C language, sample C programs basic structure of C programs. Character set, C tokens, Keywords and identifiers, Constants, Variables, Data types, Declaration of variables, assigning values to variables.

Unit-2: Operators and Expressions: Introduction, types of operators, arithmetic expressions, evaluations of expressions, mathematical functions. Managing input and output operators, reading and writing a character, formatted input and formatted output.

Unit-3: Decisions making and branching: Introduction, decision making with IF statement, simple IF statement, the IF-ELSE statement, nesting of IF-ELSE statements, the ELSE-IF ladder, switch statement. Looping, the WHILE statement, DO statement and the FOR statement.

Unit-4: Introduction to Arrays and, " Pointers, One and Two dimensional arrays, initializing two dimensional arrays, Multidimentional arrays. Understanding Pointers, declaring and initializing pointers, pointer expression, pointer increaments and scale factor, pointers and functions, pointers and structures.

Unit-5: User defined functions, need for user defined functions return value and their types, calling a function, category of functions, nesting of functions, Recursion, function with arrays, scope and lifetime of variables in function.

BOOKS RECOMMENDED:

Byron s Gottfried: Programming with C- Tata ?vlc-Graw Hill

BalaRurusamy, E. PRO Programming IN ansic-' rata Mc-Graw Hill.

Kaneekar, Y: let us 'c'

(chairman BOS)

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M.A. / M.Sc. (Statistics)

MST-C-401:

Linear Model and Design of Experiments

Objectives: The objectives of the course is to inculcate the basic concepts of linear models and design of experiments along with detailed theory. This course will cover the general linear model, Guass-Markoff Theorem, theory of analysis of variance, and design of experiments.

Outcomes: After completing this course, student will have clarity of basic concepts of general linear model, Guass-Markoff Theorem, theory of analysis of variance and design of experiments. After this course student will definitely understand the general linear model, Guass-Markoff Theorem, theory of analysis of variance, analysis of covarianceand experimental designs such as completely randomized, randomized blocks, Latin Square design, factorial Experiments, Confounding in Factorial Experiments, split Plot Design etc. along with their application in various fields.

UNIT-I – The General Linear Model, Normal Equations and Least Square Estimates, Estimability of a Linear Parametric Function, Definition of a BLUE, The Guass-Markoff Theorem, Variance and Covariance of BLUES, Estimation Space, Error Space.

UNIT-II –Analysis of Variance with One-way, Two-way and Three-way Classifications, Analysis of Covariance.

UNIT-III –Fundamental Principles of Experimental Design, Completely Randomized, Randomized Blocks and Latin Square Design, Missing Plot Technique in RBD and LSD.

UNIT-IV –Simple Factorial Experiments, Total and Partial Confounding in Factorial Experiments, 3^2 Factorial Experiments.

UNIT- V –Split Plot Design, Balanced and Partially Balanced Incomplete Block Design, Lattice Design, Youden's Square and Cross Over Designs.

Book Recommended:

1. Kshirsagar, A. M. (1983): A Course in Linear Models.
2. Rao, C. R. (1973): Linear Statistical Inference and its Application. Wiley Eastern.
3. Gupta, S. C. and Kapoor, V. K. (2011): Fundamental of Applied Statistics, Sultan Chand & Sons.
4. Das, M. N. and Giri, N. C., Design and Analysis of Experiments, Wiley Eastern.

(Chairman BOS)

(Member)

M.A. / M.Sc. (Statistics)

MST-C-402:

Mathematical Economics and Econometrics

Objectives: The objective of the course is to give in depth understanding to students about mathematical economics and econometrics. This course will cover basics concepts of mathematical economics such as supply and demand function, elasticity of supply and demand, theory of consumer behaviour, Liontiefinter industry model, Pareto's and lognormal distributions and concentration curve. Linear model, general linear model, multicollinearity, heteroscedastic disturbancesstochastic regressors, auto-correlation are the main contents of econometrics to be covered in course.

Outcomes: After completion of this course, students will have clarity about basic concepts of mathematical economics and econometrics. Student will gain a knowledge and understanding of fundamentals of mathematical economics including supply and demand function. Students will also have deep understanding about various theories of econometrics such as linear model, general linear model, multicollinearity, heteroscedastic disturbances,stochastic regressors, auto-correlation. This course will enhance the ability of students to apply various statistical techniques in the field of economy.

UNIT-I – Supply and Demand Function, Elasticity of Supply and Demand, Graphical Method of Determination of Elasticity of Demand, Theory of Consumer Behaviour, Utility Function, Marginal Utility and Indifference Curve.

UNIT-II – Maximization of Utility Function, Liontief Inter Industry Model, Pareto's and Lognormal Distributions, Concentration Curve, Gini's Concentration Ratio.

UNIT-III – Nature and Scope of Econometrics, Linear Model (Two Variables), General Linear Model.

UNIT-IV – Estimation Under Exact Linear Restrictions, Multicollinearity, Specification Error, Heteroscedastic Disturbances.

UNIT- V –Stochastic Repressors', Errors in Variables, Auto-Correlation, Test of Auto-Correlation.

Book Recommended:

1. Mathematical Economics, Allen, R.G.D
2. Theory of Linear Economics Model,Gale,D.
3. Econometrics Method ,Johnson, J.
4. An introduction to Econometrics, Klien, R.R.

(Chairman BOS)

(Member)

M.A./M.Sc.(Statistics)

MST-C-403

Statistical Quality Control and Reliability Theory

Objectives: The objective of this course is to make students capable of use of statistical methods in the monitoring, producing and maintaining of the quality of products and services. This course will give knowledge to use statistical techniques to control the quality of the process as well as products. Understanding aboutseries and parallel systems and their reliability would also be covered to make students industry friendly.

Outcomes: After completion of this course, students will have capability to use various statistical methods to control the process ofmanufacturing of a quality product and product control. After this course students will have understanding of functioning of series and parallel systems with their reliability that would be helpful in running various systems.

Unit I - Statistical Quality Control: Process & Product control, Control charts, 3-σ control limits, Control charts for variables, $\bar{X}$ and R-charts , Control chart for standard deviation, Criterion for deducting lack of control, Control chart for attributes, p-chart, and Case of variable sample size, C chart.

Unit II - Acceptance sampling by attributes, *AQL*, *LTPD*, Consumer's and Producer's risks, *AOQ*, *OC*, *ASN* and *ATI* curves. Double sampling plan, *OC*, *ASN* and *ATI* curves. Single sampling vs. Double sampling plans. Acceptance sampling by variables, Standard deviation known and unknown, Values of k and n for given two points on *OC* curves.

Unit III - Sequential Sampling plan, Graphical application, *OC* and *FPOC* curves. *ASN*function of sequential sampling plan, Advantages of sequential sampling plan.

Unit IV - Problems in life testing, Reliability, Hazard rate, Failure models, Properties of exponential distribution, Exponential failure model with one and two parameters, Properties of exponential distribution, Estimation of mean life and reliability with complete samples.

Unit V - Introduction to series and parallel systems, Reliability of series and parallel systems with identical components, Reliability of series and parallel systems with identical components having one and two parameter exponential distribution, Series-parallel systems, Parallel-series systems, k out of n systems, stand by systems.

(chairman BOS)

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Books Recommended:

1.Statistical quality control,Grant,E.L.andLeaveworth,R.S.
2.Quality control, Industrial Statistics, Duncan,A.J.
3. Sampling Inspection by variables,Bowker,A.E. and Goode,H.P.
4.The Statistical Basis of Acceptance Sampling,Ekambran,S.K.
5 Introduction to Statistical quality control,Montgomery,D.C.
6 Life Testing and Reliability ,Sinha,S.K. and Kale,B.K.