BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

M. Statistics (M.Stat.) – Course Structure under CBCS

(For the candidates admitted from the academic year 2005 – 2006 onwards)

Semester	Course	Course Title	Ins. Hrs/ Week	Credit	Exam Hrs	Marks Int	Marks Extn	Total
I	Core Course-I (CC)	Real Analysis and Linear Algebra	6	4	3	25	75	100
	Core Course-II (CC)	Measure and Probability Theory	6	4	3	25	75	100
	Core Course-III (CC)	Sampling Theory	6	4	3	25	75	100
	Core Course-IV (CC)	Distribution Theory-I	6	4	3	25	75	100
	Elective Course-I(EC)	----	6	4	3	25	75	100
II	Core Course-V (CC)	Estimation Theory	6	4	3	25	75	100
	Core Course-VI (CC)	Linear Models and Design of Experiments	6	4	3	25	75	100
	Core Course-VII (CC)	Distribution Theory–II	6	4	3	25	75	100
	Elective Course-II(EC)	----	6	4	3	25	75	100
	Extra Disciplinary Course I (EDC)	----	3	2	3	25	75	100
	Extra Disciplinary Course II (EDC)	----	3	2	3	25	75	100
III	Core Course-VIII (CC)	Quality Assurance	6	4	3	25	75	100
	Core Course-IX (CC)	Multivariate Analysis	6	4	3	25	75	100
	Core Course-X (CC)	Operation Research	6	4	3	25	75	100
	Core Course-XI (CC)	Statistical Inference	6	4	3	25	75	100
	Elective Course-III(EC)	----	6	4	3	25	75	100
IV	Core Course-XII (CC)	Statistical Practical	6	4	3	25	75	100
	Project Viva Voce 25 marks Dissertation 75 marks		24	8	-	-	-	100
			120	72				

The Department of Statistics will offer the following Elective Courses

1. Descriptive Statistics
2. Actuarial Statistics
3. Demography

The Department of Statistics will offer the following Extra Disciplinary Courses
1. Bio-Statistics
2. Data Analysis

CORE COURSE – I (CC) REAL ANALYSIS AND LINEAR ALGEBRA

Unit I

Real valued function- sequence and series of functions, uniform convergence and its application (without proof)- real valued functions of several variables- limit, continuity and derivability of functions. Maxima and minima for functions of two or three variables.

Unit II

Riemann-Stieltjes integral with respect to a non-decreasing function and its properties.

Unit III

Rank of a matrix- Elementary transformation. Elementary matrices- Echelon matrix- Hermits canonical form- Sylvester's law- Frobenius inequality- certain results on a rank of an idempotent matrix. Theory of linear equations,

Unit IV

Generalized inverse of a matrix- different classes- properties-properties of Moore and Penrose- Applications of generalized inverse in the solution of system of linear equations- solution of linear equations. Least square properties of Moore and Penrose generalized inverse- applications of M-P inverse for the solution of optimization problems.

Unit V

Eigen values and Eigen vectors- spectral decomposition of a symmetric matrix- Cayley-Hamilton theorem. Quadratic forms and inequalities- classification- positive semi-definite- Gram matrix- Quadratic form into sum of squares- Lagranges method.

Books for study

1. Goldberg.R-   Methods of Real Analysis
2. Biswas.S-   Topics in Algebra in Matrices *Ch.4:1 to 9; Ch.5:full; Ch.6:1 to 9; Ch.7:1,4; Ch.8:1 to 5.

CORE COURSE – II (CC) MEASURE AND PROBABILITY THEORY

Unit I

Events; algebra of sets, Fields: σ-fields; Borel fields, Intersection and union of fields-monotone fields and necessary properties- minimal monotone class.

Unit II

Function, inverse function, measurable function, borel function, induced σ-field, indicator functions, elementary function, concept of random variable, Borel function of a vector random variable, Limits of random variables, continuity property of probability space, Caratheodory extension theorem (statement only), induced probability space, probability as a measure.

Unit III

Distribution function, Properties, Jordan decomposition theorem, distribution function of a random vector, Marginal and conditional distributions, correspondence theorem (statement only) empirical distribution function, Expectation properties- Cramer-inequality, Holder's inequality, Schwartz's inequality, Minkowski inequality, Jenson's inequality, Basic inequality.

Unit IV

Convergence of random variables. Types of convergences: Monotone convergence theorem, Dominated convergence theorem, Characteristic function, properties, some inequalities on characteristic functions, inversion theorem and simple problems.

Unit V

Limit theorems, Law of large numbers, Weak law of large numbers, Bernoulli, Poisson and Khinchine's law of large numbers; Strong law of large numbers, Levy-Cramer theorem, Central limit theorem, De-Moivre-Laplace, Liapounov's, Llindberg-Levy theorems. Statement of Lindberg-Feller theorem.

Books for study :

1. B.R.Bhat-   Modern probability theory: Units1,2,3,4,5,6 (up to 6.55 only), 7 (up to 7.4 only)
2. Mark Fisz-   Probability theory and mathematical statistics: Unit 6 (omitting 6.4,6.5,6.10,6.13,6.14,6.15)

CORE COURSE – III (CC)   SAMPLING THEORY

Unit I

Simple random sampling: with and without replacement. Simple random sampling for proportions- Properties of these estimates- confidence limits- Estimation of sample size for proportions, Estimation of sample size for continuous data.

Unit II

Stratified random sampling - methods of allocation- Relative precision of stratified random sampling with simple random sampling- Estimation of gain in precision due to stratification – stratified sampling for proportions- Estimation of sample size.

Unit III

Systematic random sampling- linear systematic sampling- Circular systematic sampling- Estimation of the variance- comparison of systematic sampling with SRS and stratified sampling- Concept of ratio and regression estimators.

Unit IV

Cluster sampling- Equal cluster sampling- Estimator of mean and its variance- relative efficiency of cluster sampling. Optimum cluster size- Multi-stage sampling - Two-stage sampling with equal first-stage units- Estimator of mean and its variance. Two-stage sampling with unequal first stage units- Estimators of mean and its variances.

Unit V

Multiphase sampling – Double sampling for stratification – Optimal allocation – Double sampling for difference estimator – Double sampling for ratio estimator – Double sampling for regression estimator.

Books for study:

1. Moorthy, M.N. (1967)-Sampling Theory and Methods, Statistical Publisb\hing Society, Calcutta.
2. Daroga Singh and F.S.Chowdry-Theory and Analysis of sampling survey design, New age international (p) ltd, Chennai.
3. Cochran, W.G. (1984)-   Sampling Techniques, Wiley Eastern Ltd.

CORE COURSE – IV (CC) DISTRIBUTION THEORY – I

Unit – I

Mathematical and Statistical definition of probability – Concepts of events – probability of events – joint, conditional, marginal probabilities.

Unit – II

Random variables – Discrete and continuous random variables – Distribution function and probability function of a random variable – Expectation of a random variable – cumulant and moment generating functions.

Unit – III

Theoretical probability distributions – Binomial, Poission, Normal and students t distributions, chi-square and F distributions.

Unit – IV

Bivariate normal distribution and its moment generating function, Marginal and conditional distributions, regression analysis and its properties.

Unit – V

Geometric, uniform, exponential, Gamma, Beta distributions – Generating function, Mean and variance.

Books for Study and Reference:

1. Rohatgi, V.K. – Introduction to probability theory and Mathematical Statistics, Wiley Eastern
2. Gupta, S.C. and Kapoor, V.K. (1977) – Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. S.P.Gupta (1969): Statistical Method, Sultan Chand and Sons.

CORE COURSE – V (CC) ESTIMATION THEORY

Unit – I

Basic concepts of Estimation – Properties of good estimator – unbiasedness, consistency, efficiency, sufficiency – Point & Interval estimation.

Unit – II

Minimum variance unbiased estimation – Minimum variance criterion – Minimal sufficient statistics – Completeness.

Unit – III

Exponential family, location and scale family, UMVU estimation, Rao-Blackwell Theorem, Cramer Rao unquality and its generalization.

Unit – IV

Maximum likelihood estimators and their properties – asymptotic efficiency of maximum likelihood estimators, Best asymptotically normal estimators.

Unit – V

Method of estimation : Method of Moments, Minimum Chi-square, Least Squares, Method of Minimum Variance.

Books for Study and Reference:
1. E.L.Lehman (1983): Theory of point Estimation, John Wiley & Sons
2. Rohatgi, V.K. (1984): Introduction to Mathematical Statistics, Wiley Eastern.
3. C.Radhakrishna Rao (2002) : Linear Statistical Inference and its Applications, John Wiley & Sons.

Core Course – VI (CC) LINEAR MODELS AND DESIGN OF EXPERIMENTS

Unit I

Linear models- least squares estimation- estimability of a linear parametric function. Best linear unbiased estimate (BLUE) for Gauss-Markoffs set up- Gauss- Markoffs Theorem. Tests of linear hypothesis and its applications to analysis of variance. RBD with many observations per cell- its analysis- LSD – and its analysis- missing and mixed up plot technique- one and two observations missing in RBD and LSD- Analysis of non-orthogonal data.

Unit II

Factorial experiment- Effects and interactions in 2^n, 3^2,3^3 experiments. Total and partial confounding. System of confounding for 2^n experiments. Analysis of Split Plot design. Factional factorial for 2^n series only.

Unit III

Balanced incomplete block design (BIBD). Concept of connectedness and balancing-Intra block analysis of BIBD. Recovery of inter block information.

Unit IV

Partially Balanced Incomplete Block Deign (PBIBD) of two associates classes. Parametric relations and intra block analysis of PBIBD(2). Youden Square Design and its analysis.

Unit V

Design of Response surface- Linear and second order response surface designs. Concept of Lattice, weighing, Balanced and Partially Balanced n-ary and switch-over designs.

Books for study:

1. Graybill, F.A.- An introduction to Linear Statistical Models, McGraw Hill, New York.
2. Joshi, D.D.-Linear Estimations and Design of Experiments, Wiley Eastern Ltd, New Delhi.
3. Das, M.N. and Giri, N.C. -   Design and analysis of experiments, Wiley Eastern Ltd, New Delhi.
4. Aloke Day-   Theory of Block Design, Wiley Eastern Ltd, New Delhi.

CORE COURSE – VII (CC) DISTRIBUTION THEORY - II

Unit – I

Fitting of Binomial, Poisson and Normal Distributions – Compound distributions – Binomial and Poisson.

Unit – II

Negative Binomial, geometric, Pascal, Polya, Hyper-Geometric and Mutinomial Distributions.

Unit – III

Discrete uniform, Power series, Laplace, Weibull, Logistic, and Cauchy distributions.

Unit – IV

Non-Central Sampling distributions, Non-central Chi-Square t and F distributions and their properties, Distributions of quadratic form for i.i.d. standard normal variates.

Unit – V

Order Statistics, Distribution of Smallest and largest observations. Distribution of Range and Median. Distribution of rth order statistic. Joint distribution of two order statistics. Joint distribution of several order statistics.

Books for Study and Reference:
1. Rohatgi, V.K. (1984): Introduction to Mathematical Statistics, Wiley Eastern.
2. Gupta, S.C. and Kapoor, V.K. (1977) – Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. Gupta, S.C. and Kapoor, V.K. – Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

CORE COURSE – VIII (CC)   QUALITY ASSURANCE

Unit I

Quality: Quality of Design - Quality of Conformance – Quality Assurance – Quality System – Quality management – Quality Policy – Quality Objectives – Quality Control – Quality Audit – Statistical Process Control(SPC): Chance and assignable causes of quality variation – Statistical basis of the control chart – Quality improvement tools – Implementing SPC – Control charts $\bar{x}$, R, p, np, c, and u (fixed and variable sampling sizes).

Unit II

The Cumulative Sum control chart – Modified and Acceptance control charts – Group control charts – ARL procedures – Process Capability analysis – Introduction- DCA using Histogram, control chart and design of experiments – process capability ratios - estimating the natural tolerance limits of process.

Unit III

Acceptance sampling: sampling inspection versus cent percent inspection – OC curve design of single, double, multi sequential sampling plans – attributes – Explanation of AOQL, ATI, ASN – use of sampling tables IS2500 part 1, Dodge-Roming system: Dodges AOQL Plan for continuous production CSP-1, CP-2 or CSP-3. The Phillips standard sampling system MIL-std. –105d (ABC standard) (ISO 2859).

Unit IV

Concepts of reliability, maintainability and availability – reliability of series and parallel systems and others simple configurations, survival models (exponential), Weibull, Lognormal, Rayleigh and bath-tub, different types of redundancy and use of redundancies in reliability improvement. Problems in life testing, censored and truncated experiments for exponential models.

Unit V

Evaluation of software products – Quality Assurance in software development – software process maturity – five levels as per CMM – key process area – software quality assurance plan – Quality reviews and audits–reporting - Need for ISO 9000-3 certification scheme in various countries – TQM and software industry – planning for ISO 9000-3 certification.

Books for study:

1. Douglas C.Montgomery-   Introduction to statistical quality control, John Wiley 3rd edn. 1996.
2. Juran - Quality control handbook, Mc Graw Hill, 4th edn. 1998
3. Joc Sanders & Eugene Curran – Software Quality, Addison Wesley 1995.

CORE COURSE – IX (CC)   MULTIVARIATE ANALYSIS

Unit I

Multivariate normal distribution and its applications- Marginal and conditional distributions- Maximum likelihood estimation of the mean vector and its covariance matrix, total, partial and multiple correlation coefficients and their distributions (only null case).

Unit II

Hotelling T^2 statistic- Mahanalobis D^2 statistic their distributions and applications- testing the significance of mean vector and equality of mean vectors when the covariance matrices are: (i) known (ii) unknown.

Unit III

Wishart distribution- definition, derivation and properties, generalized variance- definition and distribution.

Unit IV

Discriminant analysis- Fisher's discriminant function-standards of good classification- classification into one of two normal populations- Baye's procedure of misclassification probabilities.

Unit V

Principal component analysis, definition- properties and extraction of the components- Canonical correlations and Canonical variables and their evaluation.

Books for study:

1. Anderson, T.W. (1983):   An introduction to Multivariate analysis, (2nd Edn) John wiley.
2. Johnson, A.R. and Wichern, W.D. (1988) : An introduction to applied multivariate analysis, Prentice Hall, India

CORE COURSE – X (CC)   OPERATION RESEARCH

Unit I

Linear Programming - Revised simplex method - Dual simplex method- Nonlinear programming – Kuhn-Tucker theorem.

Unit II

Integer programming - Branch and Bound technique – Dynamic programming- Principles of optimality - recursive equation approach - characteristic of dynamic programming problem - Solution of linear programming problem by dynamic problem.

Unit III

S-S policy for inventory and its derivation in the case of exponential demand- multi-echelon inventory models – models with variable supply and models for perishable items-estimation of EOQ in some simple cases.

Unit IV

Transient solution of M/M/1 queue – bulk queue (bulk arrival and bulk service) – finite queues – queues in random – G/G/1 queue and its solution – simulation of queues – flows in networks – max-flow min-cut theorem.

Unit V

Replacement problems – block and age replacement policies – dynamic programming approach for maintenance problems – replacement of items with long life.

 Books for study:

1. Wagner, H.M. - Principles of Operations research with applications to managerial decision, Prentice-hall.
2. Hadley, G.-   Non-linear and Dynamic programming, Addison Wesley
3. Taha, M.A.-   An introduction to operations research- Colliat Macmillan
4. Starr, M.K. and Miller, D.W.-   Inventory control theory and practise, Prentice Hall.
5. Soaty, T.L. -   Elements of Queueing theory with applications, McGraw Hill.

CORE COURSE – XI (CC) TESTING OF HYPOTHESIS

Unit – I

Likelihood Ratio test – for the mean of normal population – for the equality of means of two normal populations – for the variance of normal population and for the equality of the variance of two normal populations.

Unit – II

Non-parametric test – advantages and disadvantages - Kolmogorov-Smirnov (one sample and two sample) test – Wald-Wolfowitz run test - test for randomness – median test – sign test – Mann-Whitney – Wilcoxon U-test.

Unit – III

Neyman – Pearson fundamental lemma – Distribution in the monotone likelihood ratio – Confidence bounds, UMP Tests for the two sided Hypothesis – Testes for parameters in a normal distribution.

Unit – IV

Concept of Unbiasedness – application the one parameter exponential family – Similarly and completeness – UMP unbiased tests for multi-parameter exponential families – comparison of two Poisson and Binomial population application of unbiasedness.

Unit – V

Symmetry and invariance – Maximal invariance most powerful invariant tests – unbiasedness and invariance.

Books for study:

1. Rohatgi, V. - Statistical Inference, Wiley Eastern

2. Lehmann, E.L. - Testing of Statistical hypothesis, John Wiley

3. Lehmann, E.L. - Theory of Point Estimation, John Wiley

4. Gibbons, J.D. – Non-parametric statistical inference, McGraw Hill.

5. Cassella, G and Berger, R.I. – Statistical inference, Duxbury Press.

6. Rao, C.R. – Linear statistical inference and its applications, Wiley Eastern.

CORE COURSE – XII (CC) STATISTICS PRACTICAL

Sampling Theory:

Sample size estimation – SRS, SRS with Allocations, Systematics sampling, single stage cluster sampling (equal size) Two Stage cluster with equal probability.

Estimation Theory:

Unbiased estimates and efficiency – Method of moments – Maximum likelihood estimation – Method of Minimum Chi-Square – Minimum variance estimator.

Linear Models and Design of Experiments:

$\overline{X}$ Chars, R-Chart, np-Chart, U-Chart, d-chart, Acceptance sampling plan – Attributes (OC, AOQ, ASN : Single and Double sampling), Sequential sampling plans – Moving - average and moving average range charts, O.C. Curves for control charts.

Multivariate Analysis:

Hotelling's T^2 Statistic (a) Testing for $\mu = \mu_0$ (b) Testing $\mu_1 = \mu_2$, Mahalonobis D2 Statistics, Testing for equality of means, Discreminant functions, Principal component analysis.

Operations Research:

Transportation Model : North West Corner Rule, VAM, Methods – Problems of Excess demand / Supply – Assignment Model : Hungarian Method. – Game Theory : (2x2, 2xn games) translation of a game into LPP and finding the solution by simplex method. – Sequential model : Processing N jobs through two machines, Processing N Jobs through m machines – Replacement theory : Replacement of items that deteriortate over time, Replacement of items that fail completely, Individual and Group replacement policy.

Statistical Infernece:

Critical region and power curves concerning testing of hypothesis on the parameters of the following distributions when alternatives are one sided as well as two sided.
(g) Binomial Distribution (h) Normal Distribution (i) Exponential Distribution

Non-Parametic Test :

(j) Sign-Test (k) Kolmogrov – Simrnov one sample and two sample tests (l).Median Test

(m). Wald-Wolfowitz Run Test (n) Mann-Whitney U-Test (o). Test for randomness

ELECTIVE COURSE – I (EC)   DESCRIPTIVE STATISTICS

Unit I

Nature and scope of statistical methods and their limitations – preparation of questionnaire and schedule, primary and secondary sources of data – complete enumeration, controlled experiment, observational studies & sample surveys, sources of secondary data including some Government Publications. Official statistics – present population, agriculture, trade , industry, prices , labour and employment.

Unit II

Presentation by tables and by diagrams construction of tables with one , two and three factors of classifications – diagrammatic representation, frequency distributions for continuous and discrete data , graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods) and ogives.

Unit III

Measures of location dispersion, moments and measures of skewness and kurtosis for both grouped and ungrouped data. Use of Sheppard's corrections for grouped data. Bivariate data.

Unit IV

Scatter diagram , regression curve between two variables and concept of error in regression, principle of least squares and fitting of first, second degree and exponential curves, concept of correlation co – efficient and its properties , Spearman's rank correlation.

Unit V

Fundamentals set of frequencies , consistency of data , conditions for consistency , contingency table association of attributes , various measures of association.

Books for Study and Reference:

1. A.M.Goon , M.K.Gupta and B.Dasgupta (1986): Fundamentals of Statistics, Vol.I, 6th edition , World Press,Calcutta.
2. G.U.Yule and M.G.Kendall (1956): An Introduction to the theory of statistics, Charles Griffin.
3. M.R.Spiegel(1961) : Theory and problems of statistics , Schaum's outline series.
4. Snedecor and Cochran(1967) : Statistical Methods, 6th edition , IOW a State University Press.
5. Anderson, T.W. and Sclove S.L.(1978): An Introduction to statistical analysis of data, Houghton Miffin.
6. Gupta, S.C & Kapoor, V.K.: Fundamentals of Applied Statistics , Sultan Chand & Sons.

ELECTIVE COURSE – II (EC) ACTUARIAL STATISTICS

Unit I

Effective Rate of Interest – Nominal Rate of Interest – Force of Interest – Relationship between $i.i^{(m)}$ and – Present value – Effective and Nominal Rate of Discount – Present values of Immediate Annuity, Annuity-due, Increasing and Decreasing Annuities, Continuous Annuity – Accumulation of Annuities – Present value and Accumulation of Annuities increasing by step and continuously.

Unit II

Repayment of loan by Equated Installments – Capital and Interest Elements in the t-th Installment – Purchase Price of Annuities net of Tax – Loan Schedules.

Unit III

Discounted Cash flow – Definition and interpretation of Internal Rate of Return (IRR) and Net Present Value (NPV) – Comparison of two investment projects – Discounted payback period – The effects of Inflation of IRR and NPV – Yield on a fund – Time weighted Rate of Return – Money weighted Rate of Return and linked Interest Rate of Return.

Unit IV

Stochastic Interest Rate Models – Independent Annul Interest Rates – Mean and Variance of Sn An and simple problems associated with these.

Unit V

Discounted Mean Term (DMT) – Volatility – Volatility of Fixed Interest Securities – DMT of Zero Coupon Bond – Variation of Volatility with respect of coupon and valuation interest rates – Matching of Assets and Liabilities – Absolutely matched Business – Redington's Theory of Immuniztion.

Books for Study and Reference:

1. ASI Study material for subject – 102 (or)

   Chapters 1,2,3,4 (Excluding Sinking Fund) 8,10,11

ELECTIVE COURSE – III (EC) DEMOGRAPHY

Unit I

Census: Essential features information available from Indian census. Registration : Vital statistics system, deficiencies. Sample Survey: Major Demographic surveys.

Unit II

Definition computation of crude death rate, age-specific death rate, infant mortality rate, perinatal mortality rate, neo – ratal mortality and post neornatal mortality rate. Direct and indirect standardization , construction of life tables and their uses.

Unit III

Definition : crude and age specific marriage, divorce and widowhood rate, singulate mean age marriage. Definition : Computation of crude birth rate, general fertility rate, age specific fertility rate, total fertility rate, gross reproduction rate.

Unit IV

Net reproduction rate, stable population intrinsic birth rate ,death rate and growth rate, stable age distribution mean length of generation.

Unit V

Population Estimation: Component method, use of national sample surveys and registrations, cohort – component method, mathematical methods, forward – reverse survival procedure.

Projection of total population and age sex composition: mathematical methods, component methods, age sex diagrgated methods.

Books for Study and Reference:

1. Shyrock,H.S,. Siegal, J.S. Et al(1976) : Studies in population , The Methods and Materials of Demography, Academic Press.
2. Keyfitz, Nathan(1977) : Introduction to the Mathematics of population, Addision – Wesley Publishing Company, Reading Massachusetts.
3. Offices of Registrar General, Indis (1988) : Hand Book of Civil Registrations, Ministry of Home Affairs, Govt. of India, NewDelhi.
4. Bhende, A and T.Kanitkar (1988) : Principles of population studies , Himalaya publications, Bombay.

EXTRA DISCIPLINARY COURSE – I (EDC) - BIO – STATISTICS

Unit I

Nature of biological and clinical experiments and data – classification of data – Need for and nature of tabulation – charts and diagrams for data – Bar diagram, Pie diagrams, Pictograms, Histograms – frequency curves and their uses.

Unit II

Measures of Central Tendency – Mean, Median , Mode , Geometric Mean, Use of these averages in biological studies.

Measures of deviation and Standard deviation - Coefficient of variation – Measure of skewness and kurtosis.

Unit III

Correlation and regression theory – Correlation coefficient – rank correlation – Regression equations (only Problems) – Multiple and partial correlation and regression.

Basic Concepts of sampling- Simple random sample, Stratified sample- Systematic samples.

Unit IV

Test of Significance based on large samples - test for mean , variance , proportions- test for mean , , variance and attributes using , t, f and Chi – square distribution- test for correlation ,regression coefficients, Chi – square test for goodness of fit.

Unit V

Analysis of Variance : One way and Two way classifications – Completely randomized Blocks – Randomized Block design and Latin Square design (Sample problems based on biological and biochemical data).

Books for Study and Reference:

1.Sundar Rao, Jesudian, Richard – An Introduction to Biostatistics.

2. Alvi E Lewis – Biostatistics – East West Press.

3. S.P.Gupta – Fundamentals Statistical Methods – Sultan Chand.

4. Campbell – Statistics for Biologist.

EXTRA DISCIPLINARY COURSE – II (EDC) - DATA ANALYSIS

Unit I

Sampling procedure – determination of sample size and selection of sample formation of questionnaire – structured and unstructured questionnaire. Field work – Execution of survey – data collection, scaling techniques – Guttman scale – Likert 5 points scale.

Unit II

Summarizing data – tabulation – averages – dispersions – measurement of risk – relative measures of dispersion – efficiency and consistency – comparision of two or more populations – large sample test, small sample test ANOVA – Application of Statistical packages.

Unit III

Association of attributes: Chi –square test – correlation – rank difference correlation/ biserial correlation, point biserial correlation. Significance of correlation, rank correlation and biserial correlation coefficient,partial and multiple correlations. Significance of multiple regression eauation – significance of $b_o, b_l..b_n$ the linear regression coefficient – application of statistical packages.

Unit IV

Non – Parametric tests: Tests for randomness , Run test, Sigh test and Mann Whitney U test. Wilcoxon Signed rank test. Median test - statistical packages.

Unit V

Curve Fitting – Curves of type

$$Y = a+bx+cx^2 \quad Y = ab^x \quad Y = a+bx+cx \quad Y = a.e^{bx}$$

Time series – estimates of trend and seasonal variation – forecasting - statistical packages.

Books for Study and Reference:

1. Siegel, S and Castellan , NJ (1988) : Non – Parametric statistics for behavioral science McGraw Hill Book Co, NewYork.
2. Srivastava UK, Shenoy GC and Sharma SC (1989): Quantitative Techniques Managerial Decision Wiley Eastern, new delhi.
3. A.Koutsoyians (1977) : Theory of Econometrics. The MacMillon press Ltd.
4. V.K.Kapoor and SC Gupta, (1986) : Fundamentals of Mathematical Statistics , Sultan Chand and sons, New Delhi.
5. Garrett Henry E, (1973) : Statistics in Psycology and Education. Vakils, Feffer and Simons Pvt. Ltd.
6. Hoel Paul G 1957: Introduction to Statistics , Asia Publishing Housing Pvt. Ltd, New Delhi.
7. Kothari CR (1984) : Quantative Techniques, Vikas Publishing House (P) ltd, New Delhi.
8. Kothari CR (1990) : Research Methodology, Wiley Eastern Ltd, new Delhi.

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

PG Programme – CBCS

M.Sc. Statistics / M.Stat

Question Paper Pattern
2005-2006

Time : 3 Hours   **Max.: 75 Marks**

<u>Section A – (10 x 3 = 30)</u>

Two questions from each unit.

Ten questions should be asked, each carries THREE Marks

<u>Section B – (5 x 9 = 45)</u>

One question from each unit.

Five questions should be asked, each carries NINE Marks