Statistics

**POST GRADUATE DEGREE
STANDARD**

1. 1 PROBABILITY
Sample space and events, Probability measures and probability space-Random variables, Disorete and Continious random Variables, probability density and distribution functions. Simple theorems on Probability. Marginal and Conditional distributions, Expectations and moments, Independence of events, Moments and Cumulants generating functions. Borel - Cantelli lemma, characteristic function.

1. 2 CONVERGENCE OF RANDOM VARIABLES
Convergence in probability, almost sure, everywhere and in distribution - Weak law and strong law of large numbers, central limit theorem -(Lindeberg - Levy, Liapounor's, Lindoberg - Feller's). Tchebycher's inequality and Clivenko - Cantelli theorem.

1. 3 DISCRETE DISTRIBUTIONS
Uniform Binomial, Poisson, Negative - Binomial, Hypergeometric Distribution.

1. 4 CONTINUOUS DISTRIBUTIONS
Uniform, Normal, Cauchy, Beta, Gamma, Log - Normal Exponential, Weibull distributions.

1. 5 ESTIMATION
Point estimation - Interval estimation - Properties of estimates - Consistency, Unibiasedness effeciency sufficiency and Completeness, Fisher - Neyman Factorisation and Rao - Blackwell Theorems, Lehman - Scheffe theorem, Cramer - Rae inequality, method of maximum likelihood estimate and its properties, method of momentsm Chi - square and Principles of least square.

1. 6 TESTING OF HYPOTHESIS
Simple and Composite Hypothesis, two kinds of erors, power functions, most powerful test, Neyman - Pearson Lemma UMP and unbiased test, MLR property and its use for construction of UMP tests, Likelihood ratio test, Confidence intervals for large and small samples.

1. 7 NON - PARMETRIC TESTS
Tests for goodness of fit, Chi - Square and kolmogrov test. Ram test for Randomness, Median test, sign test for location, Wilcoxin - Mannwhitney U - test and Kolmogrov - Smirnov test for two sample problem sequential test, wald SPRT test.

1. 8 LINEAR MODELS
Theory of Least squares, classification of linear models, Best linear unbiased estimaters (BLUE) for Gauss - Markovs Conditions - Estimable functions, Test of linear hypothosis and its applications to ANOVA.

1. 9 MULTIVARIATE ANALYSIS
Multiple and partical correlations, Regression, Marginal and Conditional Distribution functions, MLE of mean vector and dispersion matrix for multivariate Normal. Mahalonobis D^2 and Hotelling T^2 statistic and their applications (Excluding derivation of distributions) Fisher's Discreminant analysis, Wishart Distribution (Excluding Derivation of distribution) and its properties. Factor analysis and Principle Component analysis.

1. 10 BASIC PROGRAMMING

Variables, Constants, Strings, flow charts, Basic expression and control statements, standard Library functions, subsevipted Variables. DIM and DATA statements, Simple programming problems - FORTRAN Language - Simple illustrations, Simple WORD STAR and LOTUS Commands.

PAPER - II

2.1 DESIGN OF EXPERIMENTS:-

Principles, CRD, RBD, LSD, RBD with many observations per cell, missing plot techinque, fractional experiments 2" and 3" design. General theory of partial Confounding and fractional replication, analysis of Split plot, BIBD and PBIBD, simple lattice design, lineer and second order response surface design and Youden Square Design.

2.2 STATISTICAL QUALITY CONTROL:-

Concepts of quality and meaning of Control Different types of Control Charts like x, R, p and np charts and it uses. CUSUM chart. Sampling inspection Vs 100 percent inspection, single, double, multiple and sequential plans for attribes inspection. Variable sampling plan. The OC, ASN, ATI and AOQ Curves, concept of producer's risk and Consumer's risk, AQL, LTPD, AOQL, IQL, MAPD and MAAOQ.

2.3 RELIABILITY :-

Definition of Reliability; maintainability and availability, Life distribution, failure rate and bath-tub, failure cure exponential and wleibull model. Reliability of series and parallel systems and other simple Configurations. Different types of redundancy like hot and cold and use of redundancy in reliability improvement. Problems in life testing, Censored and truncated experiments for exponential models.

2.4 SAMPLING:-

Simple random sampling systematic and stratified, Ratio and Regression estimates, Double sampling, Sampling and Non-Sampling errors. Cluster sampling, Two stage and Multistage sampling Multi-phase sampling Sample survey organisation - CSO and NSSO.

2.5 OPERATIONS RESEARCH :-

Linear Programming-Simplex procedure, Transportation and Assignment problems, Duality, Dual Simplex, Game Theory, Single and Multi period inventory Control Models-ABC analysis, Queuing Models - Waiting time distributions of M/M/1, M/M/C Models with different service policy, Service time distributions.

2.6 TIME SERIES :-

Concepts of time series, additive and multiplicative models, resolutions into Components, determination of trend by free hand drawing, Moving averages, filling of mathematical Curves, seasonal indices and the estimate of the variance for random Components, Auto-regressive, Moving averages and ARIMA models.

2.7 INDEX NUMBERS:-

Definition, Construction interpretation and limitations of index numbers, Lapeyre's Paasche'sMarshell - Edgeworth, Fisher's index numbers and their Comparisons for Good index Number. Construction for cost of living index number and Wholesale price index.

2.8 ECONOMETRICS :-

Theory and analysis of Consumer demand specification and estimation of demand function, Demand elasticities. Thery of production, supply functions and elasticities, input demand functions. Estimation of parameters in Single equation model classical least squares, generalised least squares, heteroscedasticity, serial correlation, multi collineavity, errors in variables model, simultaneous equation models, Input and output models, Identification, Rank an Order Conditions, Short-term-economic forecasting.

2.9 STOCHASTIC PROCESSES :-

Concepts, homogeneous discrete time markov Chains-illustrations. TPM Classification of states and Chains, higher transition probabilities, stability of Markov Chain, limiting behaviour, one Dimensional Random Walk. Chapman-kolmogrov equation, Ergodic theorem, Poission Processes and related distributions, Birth Process, Death Processes, Brith-Death Processes.

2.10 DEMOGRAPHY:-

Vital Statistics, birth and death ratio, rates and life table, sources of demographic data, NSS and other demographic surveys, Limitations and uses of data, Logistic and other population growth curves, GROSS and NET Reproduction rates, Morbidity and Mortality rates