U.P. HIGHER EDUCATION SERVICES COMMISSION, ALLAHABD

AGRICULTURAL STATISTICS
(Subject Code-97)

Unit 1: Statistical Methods I

Descriptive statistics. Elements of probability theory, conditional probability, Bayes' theorem. Random variable-discrete and continuous. Mathematical expectation. Moment generating function and characteristic functions. Laws of large numbers. Central limit theorem. Discrete probability distributions-binomial, Poisson, negative binomial and hypergeometric. Continuous probability distributions-normal, rectangular, Cauchy, exponential, gamma and beta distribution of I and II kind. Sampling distributions-chisquare, t, and F. Bivariate normal distribution-conditional and marginal probability distribution.

Point estimation-unbiasedness, consistency, efficiency, sufficiency. Completeness, Minimum variance unbiased estimator. Cramer-Rao Inequality. Rao-Blackwell theorem and Lehman-Scheffe theorem. Methods of point estimation like Maximum likelihood, Moments, Minimum chi-square. Confidence interval estimation. Testing of hypotheses-two types of errors, level of significance and power of a test. Neyman- Pearson Lemma. Uniformly most powerful tests and their construction. Unbiased test, Likelihood ratio test. Tests of significance based on Z, t, chi-square and F distributions.

Unit 2: Statistical Methods II

Correlation, rank correlation, correlation ratio, intra-class correlation. Simple and multiple regression analysis, partial and multiple correlation. Examination of residuals. Model-adequacy, Selecting best regression. Order Statistics. Nonparametric tests-run, sign, rank, Wilcoxon, Kruskal-Wallis, Mann-Whitney, Cochran and Friedman's tests. Contingency tables. Log linear models. Sequential analysis-sequential probability ratio test. Elements of stochastic processes. Multivariate normal distribution-estimation of mean vector and dispersion matrix. Wishart distribution, Hotelling T_2, multivariate analysis of variance, principal component analysis, factor analysis, discriminant analysis, cluster analysis.

Unit 3: Statistical Genetics I

Statistical analysis of segregation, detection and estimation of linkage. Gene and genotypic frequencies. Random mating and equilibrium in large populations. Disequilibrium due to linkages for two pairs of genes and for sex linked genes. Selection, mutation and migration. Equilibrium between forces in large population. Polymorphism. Fisher's fundamental theorem of natural selection. Polygenic systems for quantitative characters, Concepts of breeding value, dominance, average effect of gene and epistatic interactions

Unit 4: Statistical Genetics II

Genetic variance and its partitioning. Correlation between relatives. Regular system of inbreeding, effects of inbreeding. Genotype and environment interaction, stability parameters. Estimation of heritability, repeatability and genetic correlation. Path coefficient analysis. Heterosis, concepts of general and specific combining abilities. Diallel crosses and line $\times$ tester analysis. Response due to selection. Prediction of response to individual, family and combined selections. Construction of selection index.

Unit 5: Design of Experiments I

Linear models − Random, fixed and mixed effects. Nested and crossed classifications. Gauss-Markoff theorem. Analysis of variance. Principles of design of experiments. Uniformity trials. Completely randomized design. Randomized complete block design. Latin square design. Factorial experiments-2_n and 3_n series and asymmetrical factorial experiments, confounding in 2_n and 3_n experiments, split and strip-plot designs, change over designs. Missing plot techniques. Analysis of covariance. Variance stabilizing transformations.

Unit 6: Design of Experiments II

Balanced incomplete block designs and their analysis with and without recovery of inter block information. Partially balanced incomplete block designs with two associate classes, lattice designs. Youden square design. Multiple comparison procedures. Fractional replication of symmetrical factorials, confounding in asymmetrical factorial experiments. Response surface designs, second order rotatable designs. Combined analysis of groups of experiments. Sampling in field experiments. Experiments on cultivators' fields.

Unit 7: Sample Surveys I

Sampling versus complete enumeration. Concept of probability sampling. Simple random sampling. Stratified sampling, allocation in stratified sampling, choice of strata, construction of strata boundaries and collapsing of strata. Use of auxiliary information in sample surveys, ratio and regression methods of estimation. Systematic sampling. Cluster and multi-stage sampling with equal probability.

Unit 8: Sample Surveys II

Sampling with unequal probabilities with and without replacement, sampling schemes with inclusion probabilities proportional to size. Unbiased ratio type of estimators, Double sampling, sampling on successive occasions, inverse sampling. Non-sampling errors-sources and classification. Non-response in surveys-interpenetrating sub-samples, randomized response techniques, imputation methods. Design and organization of pilot and large scale surveys. National sample surveys. Agricultural Statistics system in the country-land use Statistics, crop estimation surveys, livestock and fishery Statistics.

Unit 9: Computer Applications

Computer Organization and Architecture- number system, input/output unit, memory unit, arithmetic logic unit and control unit.

Computer algorithms. Programming in C-Building blocks, control structures, arrays, pointers, dynamic memory allocation, file management. Data Structures-linked list, stack, queue, tree, graph, sorting and searching algorithms. Data Base Management System-definition and features, data models, relational database. Object oriented programming-encapsulation, inheritance, olymorphism with C++/JAVA. Networking-need, basic concepts, types of networks. Connecting computers-local area networks, wide area networks. Value added network services −E-mail, on-line

services, Internet, etc. Hyper-Text Markup Language (HTML), Building static and dynamic web pages.

Numerical analysis-interpolation, numerical integration, solution of ordinary differential equations, solution of linear and non-linear system of equations. Modeling and simulation-random number generation and testing, discrete simulation models, simulation of stochastic events and processes, design of simulation experiments, analysis of data generated by simulation experiments, validation of simulation models. Linear Programming-formulation and graphical solution, simplex method, duality, transportation and assignment problems.

Note- Six Question is compulsory from each unit.