SYLLABUS: DEPARTMENT OF AGRICULTURAL STATISTICS

Courses Offered by Department Of Agricultural Statistics in M.Sc (Ag.) programme

Course No.	Name of the Course	Credit Hours	Semester
STAT 550	Statistical methods for applied sciences	3+1	I
STAT 551	Experimental designs	3+1	II
STAT 552	Bio-assay	3+0	II
STAT 553	Nonparametric techniques	2+1	II
STAT 554	Data analysis	1+2	III

STAT 550   Statistical methods for applied sciences   3+1

Objectives:

This course is meant for students who have some knowledge on basic statistical tools and techniques. The students would be exposed to those concepts of statistics that deal with modelling observed data using different probability models, how to draw a good sample from a population in order to make some valid conclusion about the population a population parameter etc.

Syllabus:

Theory

UNIT I

Random variables, Probability mass function, Probability density function, mathematical expectation, continuous probability distribution, Normal distribution and its applications.

UNIT II

Correlation and Linear regression, Fitting of quadratic curve, Method of least square, Multiple linear regression, Multiple and partial correlation upto two independent variables.

UNIT III

Concept of sampling, Concept of population, sample, parameter, statistic etc., Sampling unit, Sample size,

Sampling frame, Sampling versus complete enumeration, Sampling and non-sampling errors,Probability and non-probabilitysampling, Sampling from a finite and infinite population, Sampling techniques: Simple random sampling with and without replacement, Stratified random sampling, Allocation problem in stratified random sampling, Concept of cluster sampling.

Practical

Problems related to the topics mentioned in the theory syllabus.

Learning Outcome:

Students will be well equipped to handle field level data for analysis and modelling purposes. They will learn how to draw a good sample from a population in order to draw valid inference

about the population a population parameter and how to build multiple linear regression models and study correlation among them under a multivariable set-up.

STAT 551   **Experimental designs**   **3+1**

Objectives:

This course is designed to give a comprehensive knowledge on how to design a study or experiment so that the results of the experiments are free from errors or biases, and then how to draw a valid conclusion using the results so obtained. In this context, laying out of different agricultural field experiments will also be covered. Designing an experiment is an integrated component of research in almost all sciences.

Syllabus:

Theory

UNIT I

Basic principles of design of experiments: randomization, replication and local control. Uniformity trials, Analysis of variance,Basic experimental designs:Completely randomized design (CRD), Randomized complete block design (RBD) and Latin square design (LSD), Missing plot technique.

UNIT II

Factorial experiments: symmetrical and asymmetrical, Split plot design, Strip-plot design, Analysis of co-variance in CRD and RBD.

UNIT III

Response curves and input optimization.

Practical

Problems related to the topics mentioned in the theory syllabus.

Learning Outcome:

The students would be exposed to various concepts of designing an experiments so as to enable them understand the science involved in planning, designing their research experiments and how to make analysis of different experimental data.

STAT 552   **Bio-assay**   **3+0**

Objectives:

To develop expertise in modelling different biological phenomena, where the observations are of special characters. Different types of growth models will be studied to model such data sets. More frequently applied statistical tools may not be applicable directly to such data sets. Some transformations may needed before making the data fit for application of different statistical

tools. Skills of selecting appropriate transformation to make the data set amenable for application of statistical tools for a particular situation will be developed at the end.

Syllabus:

Theory
UNIT I
Principle of biological assays, Direct assay, Quantitative dose-response relationship, Analytical assay, Parallel line assay, Slope-ratio assay.
UNIT II
Dose response curve, Quantal response, Probit transformation, Estimation of median effective dose, Relative potency.
UNIT III
Concept of Mathematical model, Classification of Mathematical models, Growth model, Nonlinear growth models: Malthus model, monomolecular model, logistic model and Gompertz model.

Learning Outcome:
Expertise in handling data related to different biological variables in relation to their modelling will be developed. The course, as expected, will help the student modelling of biological data in a better way and making proper inference for data sets where data have to be transformed to make them amenable for usual statistical treatments.

STAT 553   **Nonparametric techniques**   **2+1**
Objectives:
The course will introduce different inferential procedures used to analyze data when there is no knowledge about the functional form of the population distribution from which the sample has been drawn. The students will learn how to test different hypotheses related to location and scale parameters for one or more populations.
Syllabus:
Theory
UNIT I
Classification of data, Variables and attributes, Concept and scales of measurement, Basic ideas of nonparametric procedures, Need for nonparametric tests.

UNIT II
Run test for the randomness, Tests for location parameter: One sample and paired sample Sign test and Wilcoxon signed-rank test, Mann-Whitney U-test for two independent samples.

UNIT III

Kruskal-Wallis test (Nonparametric one-way ANOVA), Friedman,stest (Nonparametric two-way ANOVA), Chi-square test for goodness of fit and independence of attributes.

Practical

Problems related to the topics mentioned in the theory syllabus.

Learning Outcome:

It is expected that the students will develop skills to draw inference from data sets which are non-normal and are not of quantitative nature.

STAT 554	Data analysis	1+2

Objectives:

This course is meant for the students to let them know about the usage of various statistical packages for analyzing data. It would provide the students a hands on for analysing their research data along with some basic ideas on the statistical tools used in the research analysis with their applications.

Syllabus:

Theory

UNIT I

Introduction of Software packages for data analysis, Classification of data, Summarization and tabulation of data, Graphical representation of data, Descriptive statistics

.UNIT II

Fitting of probability distributions; Binomial, Poisson and Normal, Testing of hypothesis: Z-test, t-test,Chi-square test and F-test.

UNIT III

Analysis of variance and covariance, Experimental designs, Correlation and regression, Logistic regression, Concept of time series.

UNIT IV

Multivariate Statistical Analysis: Principal component analysis, Mahalanobis distance, Factor analysis, Cluster Analysis.

Practical

Uses of software packages like excel, SPSS, R and INDOSTAT etc. to solve the problems related to the topics mentioned in the theory syllabus.

Learning Outcome:

Some expertise on analysing data using software packages will be developed. Special skills will be developed for reading of the output tables and picking up of the right numbers from the output

tables for inferential purposes. At the end, Skills will be developed in writing computer programmes when it is not available in the menu driven software packages.

Ph. D. Syllabus in the Department of Agricultural Statistics

Course No.	Title	Credit
AST 601	Research methodology and techniques	4+0
AST 602	Advanced courses on statistical inference	4+0
AST 604	Reviewing of published research work and presentation of synopsis	4+0

AST 601   **Research methodology and techniques**   **4+0**

Objective:

The course has been designed to give ideas about research and its various steps and designs. Data being the core of any research, this course will also give ideas on data classification and their collection, sampling techniques and concepts of parametric and nonparametric test procedures.

Syllabus:
Unit I
Concept and meaning of research-Purpose of research in social science-characteristics of research in behavioural science
Theories of research- Construction of theories –Steps in research-Selection of problems-Formulation and testing of hypotheses- generalization.
Research Design- types of research designs-Recent trends of behavioural research and its research designs.
Details of sampling procedures-Probability sampling-simple random sampling techniques-multistage sampling-pps sampling- stratified sampling- cluster sampling-systematic sampling—Non probability sampling-quota sampling-spatial sampling-representative sampling-Survey procedures, Sampling errors.
Sources and types of data- Different formal and informal methods of data collection-Construction of structured schedule and questionnaire-pilot study and pretesting-logistic arrangements of data collection.
Variables –classification and oprationalization of different types of variables relevant to behavioural science.
Unit II
Introduction to testing of hypotheses, Simple and composite hypotheses-Parametric and Nonparametric approaches- Concepts of errors-levels of significance
Standard parametric (univariate and bivariate Populations) test related to dependent populations. Some standard nonparametric test procedures and their applications.

Learning Outcome:

Skills of doing research will be increased and the power of drawing valid conclusions from the analysis of research data will be enhanced.

AST 602 **Advanced courses on statistical inference** **4+0**

Objectives:

Idea on different procedures of statistical inferences will be given. Different estimation procedures to estimate the population parameters of interest and different procedures of testing of hypothesis will be covered.

Syllabus:
Unit I
Estimation: point and interval estimations, properties of estimators, Mean square error (MSE), and minimum mean square error estimator, unbiasedness and minimum variance unbiased estimator, Rao-Cramer lower bound variance
Unit II
Methods of estimation: method of moments, method of maximum likelihood
Unit III
Introduction to testing of hypotheses, Parametric and Nonparametric Approaches, Simple and Composite hypotheses, concept of errors, level of significance of a test, standard parametric (univariate and bivariate populations) tests related to two independent populations, tests related to correlation coefficient. Some standard nonparametric test procedures.
Learning Outcome:
Expected to learn different techniques of statistical inferences, so that valid conclusion can be drawn having analysis of data.

AST 604   Reviewing of published research work and presentation of synopsis 4+0
Objectives:
The course will basically training on how to write a thesis and how to present the research findings in seminar.
Syllabus:
Unit I Meaning of Thesis –Some basic dimensions and formality of submission- Components of thesis and their importance
Unit II Presentation and writing of synopsis
Unit III Developing Seminar presentation
 Unit IV Writing the introduction-Conducting review of literature - Developing theoretical orientation and framing conceptual model-Organizing research methodology chapter-writing the findings and discussion chapter- drawing the summary and conclusion – writing implications and framing empirical model-citing the references and appendices

Learning Outcome:

Expected that student will learn different aspect of writing a Ph. D. thesis. Enough skills will be developed in writing different components of a thesis like introduction, review of literature, research methods, bibliography etc.