Scheme of Examination for Pre-Ph.D (Statistics) 2014-15.

The duration of the course of instruction of Pre-Ph.D (Statistics) Degree shall be of (one semester). There will be three theory papers each of 100 marks (including Internal Assessment of 20 Marks.

Pre-Ph.D

Name of Paper	**Theory Marks**	**Internal Assessment**	**Time Allowed**	**Teaching Hrs. Per week**
Paper-I MSMP1: Research Methodology	80	20	3 hrs.	04
Optional Papers-II & III (MSMP2 & MSMP3)				
Any Two of the following:				
option (i) Statistical Genetics	80	20	3 hrs.	04
option (ii) Regression Analysis and Bayesian Inference	80	20	3 hrs.	04
option (iii) Advanced Theory of Sample Surveys	80	20	3 hrs.	04

HOD STATISTICS

Pre-Ph.D (Statistics)

MSMP1 (Research Methodology)

Time: 3 Hours
Teaching Hours: 4 Hours per week

Maximum Marks: 80
Internal Assessment Marks: 20
Total Marks: 100

Unit – I

Types of Data and Various Methods of Data Collection. Case Study Method. Questionnaires and Schedules. Guidelines for Successful Interviewing. Compilation of Data Coding, Editing and Tabulation of Data. Measurement and Scaling Techniques: Measurement Scales, Tests of Sound Measurement, Meaning of Scaling, Scale Classification Bases, Important Scaling and Scale Construction Techniques. Reliability and Validity of Measurements.

Unit – II

Exploring Univariate and Multivariate Data Using Tables and Plots (Stem and Leaf Display, Box Plots, Median Polish of two way Tables, Root Grams and Bubble Charts, Spider Plots, Scatter & Multiple Scatter Plots: Q-Q Plots and Probability Plots). Graphical Methods of Clustering (Chernoff Faces). Data Analysis using tools like SPSS, MATLAB, SAS and MS Excel.

Unit – III

Generating Data from Standard Discrete and Continuous Distributions, (Binomial, Poission, Normal, Exponential, Gamma, etc.). Variance Reduction Techniques in Simulation, Box Cox Transformations, Resampling, Methods, Permutation Test, Bootstrapping, Jackknifing and Cross Validation.

Unit - IV

Research Methods: Meaning, Objectives, Types and Significance of Research. Research Process and Criteria of Good Research. Research Problem and its Necessity. Research Designs. Sampling Designs. Characteristics of a Good Sample Design. Random Samples and Determination of Sample Size.

Documentation and Scientific Writing: Preparation of Dissertation, Types and Layout of Research, Precautions in Preparation of Research Reports, Bibliography, References and Annexure. Citation Styles.

Books Suggested:

1. Kothari, C.R. : Research Methodology (Methods and Techniques) (New Age International Publishers)
2. Panneerselvam, R : Research Methodology (Prentice Hall of India, New Delhi)
3. Khan, J.A. : Research Methodology (APH Publications, New Delhi)
4. Khanzode, V.V. : Research Methodology (Techniques and Trends) (APH Publications, New Delhi)
5. Dursten, B.H. & Poole, M : Thesis and Assignment Writing (Wiley Eastern)
6. Tukey, J : Exploratory Data Analysis (Addison-Wesley Pub Co., USA)

Note: The examiner is to set the question paper into four units. In each unit, he/she has to set two questions of 16 marks each from sections I, II, III, & IV respectively. The candidate will attempt five questions in all, selecting at least one question from each unit.

Pre-Ph.D (Statistics)

MSMP2 & MSMP3 Option (i)
(Statistical Genetics)

Time: 3 Hours
Teaching Hours: 4 Hours per week

Maximum Marks: 80
Internal Assessment Marks: 20
Total Marks: 100

Unit-I

Basic Terms and Definition In Genetics, Concepts of Gene Frequencies and Their Estimation, Mendal's Laws Linkage and Crossing Over. Statistical Analysis for Segregation: Single Factor Segregation, Two Factors Segregation, Heterogeneity Chi-Square, Detection and Estimation of Linkage for Qualitative Characters, Sex Linked Inheritance, Gene Action Interaction, Multiple Alleles, Pleiotropic Action, Lethal Action, Mutation.

Unit-II

Random Mating: Hardy- Weinberg Equilibrium, Panmixia Population, Single Locus, Sex Linked Genes, Fisher's Fundamental Theorem of Natural Selection, forces Affecting Gene Frequencies, Selection, Mutation and Migration, Equilibrium Between forces In Large Population.

Unit-III

Polygenic System for Quantitative Characters: Polygenes, Major Genes, Characterization of Phenotypic Value, Additive and Genetic Effects, Characterization of Genotypic Value, Breeding Value and Dominance Deviation, Determination of Parameters of Additive – Dominance Model.

Unit-IV

Components of Variance and Genotypic Variance, Components of Covariance, Correlations Between Relatives, Genetic Parameters; Heritability, Repeatability and Genetic Correlation, Relationship Between Them.

Books suggested:

Falconer, D.S. : Introduction to quantitative Genetics (Longman Group Ltd.)

Kempthorne, O (1953) : An Introduction to Genetical Statistics (Wiley Eastern)

Prem Narain : Statistical Genetics (Wiley Eastern)

Li, C.C. : Population Genetics (University of Chicago Press Cchieage & London)

Jain, J.P. : Statistical Technique in Quantitative Genetics (Tata Mc Graw, Hill Publication Co. Ltd., New Delhi)

Note: The examiner is to set the question paper into four units. In each unit, he/she has to set two questions of 16 marks each from sections I, II, III, & IV respectively. The candidate will attempt five questions in all, selecting at least one question from each unit.

Pre-Ph.D (Statistics)

MSMP2 & MSMP3 Option (ii)
(Regression Analysis and Bayesian Inference)

Time: 3 Hours
Teaching Hours: 4 Hours per week

Maximum Marks: 80
Internal Assessment Marks: 20
Total Marks: 100

Unit I

Matrix Approach to Linear Regression, R^2 and adjusted R^2, Model Adequacy Checking – Residual Analysis, methods of scaling residuals- Standardized and Studentized residuals Press Residual, Residual Plots, PRESS Statistic, Variance Stabilizing Transformation, Analytical methods for selecting a transformation.

Unit II

Generalized and Weighted Least Squares. Diagnostics for Leverage and Influence, Variable Selection and Model Building, Computational Techniques for Model Selection- Mallow's C_p , Stepwise Regression, forward Selection, Backward Elimination. Elementary Ideas of Logistic and Poisson regression

Unit III

Concepts of Prior and Posterior distributions and Non – Informative and Improper priors. Baye's theorem and computation of posterior distributions, Standard Loss functions, and concept of Baye's estimation, Mixture Distributions, Sufficient Statistics, Exponential Family of distributions.

Unit IV

Natural conjugate family of priors for a model, Conjugate families for exponential family models, Jeffrey's Prior, Asymptotically Locally invariant prior. Maximum Entropy priors and associated Bayes Estimation.

Books Recommended

1. Montgomery, D.C, Peck. and Vining, G.G. : Introduction to Linear Regression Analysis (John Wiley & Sons)
2. Draper, N.R. and Smith, H. : Applied Regression Analysis (John Wiley & Sons)
3. Robert, C.P. : The Bayesian Choice: A Decision Theoretic Motivation (Springer Verlag New York)
4. Sinha , S.K. : Bayesian Estimation (Inst. of Mathematical Statistics)
5. Berger, J.O. : Statistical Decision Theory and Bayesian Analysis (Springer)

Note: The examiner is to set the question paper into four units. In each unit, he/she has to set two questions of 16 marks each from sections I, II, III, & IV respectively. The candidate will attempt five questions in all, selecting at least one question from each unit.

Pre-Ph.D (Statistics)

MSMP2 & MSMP3 Option (iii)
(Advanced Theory of Sample Surveys)

Time: 3 Hours
Teaching Hours: 4 Hours per week

Maximum Marks: 80
Internal Assessment Marks: 20
Total Marks: 100

Unit –I

Types of Sampling: Simple Random, Stratified Random and Systematic Sampling, Estimation In Ratio and Regression Estimators, (for One and Two Variables), Double Sampling for Ration and Regression Estimators, Double Sampling for Stratification.

Unit-II

Sampling With Varying Probabilities, Ordered and Unordered Estimators, Sampling Strategies Due To Horvitz Thomson, Yales and Grundy form Midzuno Sen, Brewerand Durbin Scheme (Sample Size Two Only) Rao-Hartley, Cochran Scheme for Sample Size N with Random Grouping and PPS Systematic Sampling, Double Sampling for PPS Estimation.

Unit-III

Single Stage Cluster Sampling: Multi-Stage Sampling, Selection of PSU's with Unequal Probabilities, Selection of PSU with Replacement, Stratified Multi-Stage Sampling, Estimation of Ratios, Choice of Sampling and Sdub-Sampling Fraction, Repetitive Surveys, Sampling on More than two occasions.

Unit-IV

Non-Sampling Errors, Response Errors, Response Bias, The Analysis of Data, Estimation of Variance Components Uncorrelated Response Error, Response and Sampling Variance, The Problem of Non-Response, Some Example of Sources of Error. Variance Estimation, Method Estimation of Random Groups Sub Population. The Best Linear Estimator Two Way Stratification with Small Sample, Variance Estimation in Multistage Sampling, Sampling Inspections.

Books suggested

1.	Chochran, W.G.	:	Sample Techniques (John Wiley & Sons)
2	Deshraj and Chandok	:	Sampling Theory (Create Space Independent Publishing Platform)
3	Singh & Chaudhary F.S. Designs	:	Theory and Analysis of Sample Survey (Wiley)
4	Mukhopadhyay, Parimal	:	Theory and Methods of Survey Sampling (PHI Learning Private Limited)

Note: The examiner is to set the question paper into four units. In each unit, he/she has to set two questions of 16 marks each from sections I, II, III, & IV respectively. The candidate will attempt five questions in all, selecting at least one question from each unit.