Scheme of Examination for Pre-Ph.D Course work for Doctor of Philosophy Statistics 2010-11

The duration of the Pre-Ph.D. Course shall be one semesters. There will be three theory papers each of 100 marks. The detailed Scheme of the course is given below:

Pre-Ph.D. Course work for Ph.D. (Statistics).

Name of Paper		Theory	Internal Assessment	Time Allowed	Teaching Hrs. per week
Paper-I	Research Methodology	80	20*	3 hrs.	04
Paper-II & III	Any two of the following options: **				
Opt. (i)	Stochastic Processes	80	20	3 hrs.	04
Opt. (ii)	Advanced Theory of Sample Surveys	80	20	3 hrs.	04
Opt. (iii)	Regression Analysis and Bayesian Inference	80	20	3 hrs.	04

***** Internal assessment of 20 marks in each theory paper will be based on assignment(s) and Seminar(s).

****** More options may be added from time to time depending upon the availability of the expertise in the department and its suitability for the prospective researches.

Pre-Ph.D.Course

Paper-I
Research Methodology

Maximum Marks: 80
Time Allowed: 3 hrs.

Unit-I

Introduction: Meaning, objectives, types and significance of Research. Research Methods versus Methodology. Process of Research: Steps involved in research process, Research problem and its selection, Necessity of defining the problem, techniques involved in defining a problem with example.
Research Design: Meaning, Need, Feature and Importance of Research Design, various research designs.

Unit-II

Types of data and various methods of data collection, framing of questionnaire, check-list, concept of reliability and validity methods, compilation of data, coding, editing and tabulation of data, various sampling methods.
Random Number Generation, Mid-square method of Generating Pseudo-Random Numbers, Simulation techniques: Monte-Carlo Simulation and Applications.
Use of data analysis tools like SPSS, Minitab and MS Excel.

Unit-III

Statistical techniques for analyzing data: Measures of Central tendency measures of Dispersion, Importance of sampling distributions. Testing of Hypothesis: Parametric and Non-Parametric tests. Application of analysis of variable (ANOVA) and Covariance (ANCOVA).

Unit-IV

Preparation of Dissertation: Types and layout of Research, Precautions in preparing the research dissertation, Bibliography, reference and annexure, discussion of results, draurg conclusions given suggestions and recommendations to the concerned persons.

Books suggested:

1.	C.R. Kothari	:	Research Methodology (Wiley Eastern Publication)
2.	J.K. Sharma	:	Operations Research
3.	Goon, A.M., Gupta, M.K. and B. Das Gupta		Fundamentals of Statistics (Vol. I and II)

Pre-Ph.D.Course

Paper II, III
Opt. (i) Stochastic Processes

Max Marks- 80
Time- Three Hours

Unit I

Stochastic Processes, Random Walk model, Gambler's Ruin problem, Ballot Problem, Applications of Ballot problem, Generalized Random Walk.

Unit II

Continuous time Discrete State Markov Process, Population Models, Poison Process, Continuous Time and Continuous State Markov Process, Differention process, Kolmograow backward and forward difference equation, Wiener Process, First passage Time distribution

Unit-III

Renewal theory, renewal equation, renewal theorems, Central limit theorem for renewal theory, Delayed and equilibrium renewal process, residual and excess life times renewal, renewal process.

Unit IV

Applications to population growth, Queuing models, Epidemic processes, simple epidemic, General epidemic, application in ecology, biology and sociology.

Books:

1	Baily, NTJ	the Elements of Stochast6ic Processes
2	Cox, DR & Miller, HD	The Theory of Stochastic Processes
3	Basu AK	Introductions to Stochastic Processes
4	Medhi, J.	Stochastic Processes
5	Bhatt, B.R.	Stochastic Models, Analysis and Application

Note: The examiner will set two questions from each section. The students are required to attempt five questions in all, selecting at least one question from each section.

Paper II, III
Opt. (ii) Advanced Theory of Sample Surveys

Max Marks- 80
Time- Three Hours

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
2	Desrjv and Chandok	Sampling Theory
3	Singh & Chaudhary F.S.	Theory and analysis of sample Survey designs.
4	Mukhopadhyay, Primal	Inter Problems in survey sampling

Note: The examiner will set two questions from each section. The students are required to attempt five questions in all, selecting at least one question from each section.

Paper: II, III
(Opt. iii) Regression Analysis and Bayesian Inference

Max Marks- 80
Time- Three Hours

Unit I

Simple Linear Regression, Estimation of parameters, Matrix Approach to Linear Regression, R^2 and adjusted R^2 , Weighted Least Squares. Model Adequacy Checking – Residual Analysis, methods of scaling residuals- Standardized and studentized residuals Press Residual, Residual Plots, PRESS Statistic

Unit II

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

Mixture Distributions, Exponential Family of distributions, Prior and Posterior distributions, Baye's theorem and computation of posterior distribution, Natural conjugate family of priors for a model, Conjugate families for exponential family models

Unit IV

Non – Informative and Improper priors, Jeffrey's Prior, Asymptotically Locally invariant prior. Maximum entropy priors, Bayes estimation.

Books Recommended

Montgomery, D.C, Peck and Vining, G.G. (2002). Introduction to Linear Regression Analysis (John Wiley & Sons.)

Draper, N.R. and Smith, H. (1981) Applied Regression Analysis (John Wiley & Sons)

Robert, C.P. (2001): The Bayesian Choice: A Decision Theoretic Motivation (Springer Verlag New York)

Sinha , S.K. (2004) Bayesian Estimation

Berger, J.O. (1985) Statistical Decision Theory and Bayesian Analysis (Springer)

Note: The examiner will set two questions from each section. The students are required to attempt five questions in all, selecting at least one question from each section.