Department of Statistics
Shivaji University, Kolhapur

The syllabi and structure of the question papers for the Pre-Ph.D./ M.Phil. course in Statistics (To be effective from 2010-2011)

- **There shall be three papers :**

  Paper – I : Research Methodology.

  Paper – II : Recent Trends in Statistics.

  Paper – III : Topics in Statistics (Related to the area of research topic).

- **Structure of the question papers:**

1. The question papers I and II will consist of 100 marks and will have 8 questions each of 20 marks. Five out of eight questions are have to be attempted.
2. Question paper for paper-III will be for 80 marks having 8 questions each of 16 marks of which FIVE questions are to be attempted.
3. 20 Marks are reserved for a seminar. A student is expected to review a research paper in Statistics, published during last five years in national or International Journal of repute. The candidate should give seminar on the review of the selected paper. The research paper preferably should be related to the topic of research.

Paper –I : Research Methodology

Unit I: Paradigms of Research: Creative Reading, Critical Reading, Critical Thinking and Literature Review. Steps in finding a Research problem. Research Strategies: Experiments, Design and Creation, surveys, case study research, Action research, bind Ethnography. Data gathering methods. Information Technology in Research Use of word processor, spreadsheets, presentation managers; Internet concepts, searching the web, Managing personal blogs, Open source software and its use in Research (emphasis on R)

(15)

Unit II: Monte Carlo techniques : Simulation from univariate and multivariate distribution, Importance sampling, Numerical methods for integration, differentiation. Programming in R for implementing these techniques Macros in MINITAB & MATLAB

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Unit III : Convergence of real numbers. Limit inferior and limit superior of the sequences. Various modes of convergence of sequence of random variables.

(15)

Unit IV: Multivariate Data analysis principal components, factor analysis, cluster analysis. Implementation of these techniques using statistical software.

(15)

References :

1. Briony J. Oates (2007) researching Information system and Computing: sage Publications.
2. Malik S.C. and Arora S. (1991) Mathematical Analysis Wiley Easteon Ltd IInd editor.
3. Billingsley P (1986) Probability and Measure John Wiley and sons.
4. Karr Alan (1993) Probability Theory Springer verlag.
5. Bhat B.R.(1981) Modern Probability Theory. New Age Pub. IIIrd Edition.
6. Johnson R.A. and Wichern D.W. (2002) Applied Multivariate Analysis 5th Edition. Prentice Hall.

Paper – II : Recent Trends in Statistics

Unit I : Introduction to Bootstrap and Jackknife methods, Applications in point estimation, and confidence intervals cross-validation of prediction. Markov Chain Monte Carlo Methods and applications EM algorithm Metropolis-Hasting Algorithm, Gibbs Sampling.

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Unit II : Artificial Neural Network : fundamental concept and models of Artificial Neural systems, feed forward and feedback networks, perception learning rule. Single layer perception classifiers. Multilayer feed forward networks. Support vector Machines: Problem formulation, Lagrangian theory, Duality, support vector classification, support vector regression implementation techniques.

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Unit III: Generalized Linear Models: The exponential family, Likelihood Theory and moments, Linear structure and the link functions, estimation procedures-Newton Rap son, WLS, IWLS, Residuals and Model fit.

(15)

Unit IV: Nonparametric Regression: Basic idea of smoothing, spline smoothing, kernel regression. Nonparametric designing estimation. The naïve estimator, The Kernel estimator, The nearest neighbour method, The variable Kernel Method, Orthogonal series estimators, Maximum penalized likelihood estimators, General weight function estimators.

(15)

References :

1. Christian Robert and George Cassella (2004) Monte Carlo statistical Methods Second Edition, Springer.
2. Christian Robert and George Cassella (2010) Introducing Monte Carlo Methods with R- Springer.
3. Efron B. and Tibshiram R.J. (1993) An Introduction to Bootstrap Champs man and Hall / CRC
4. Davison A.C. and Hinkley D.V.(1997) Bootstrap Methods and Their Applications Cambridge University Press.
5. Critianini N and Shawe-Taylar John (2000) An Introduction to Support vector machines Cambridge University Press.
6. Zurada J.M. Introduction to Artificial Neural systems.
7. Silverma, B.W.: Density estimation for statistics and data analysis.
8. Gill, J.: Generalized linear models: A unified a approach http://dionysus.psych.wisc.edu/lit/Topics/Statistics/SAGESeries/SAGE GeneralizedLinearModels.pdf.
9. Hardle, W. Applied nonparametric regression. http://www.globalsepri.org/UploadPhotos/2008912164043348.pdf

Paper – III : Topics in Statistics (Related to the area of research topic)

i. Statistical Analysis of Circular Data.
ii. Topic in Asymptotic Inference.
iii. Topic in Distribution Theory.
iv. Applied Regression Analysis.
v. Topic in Discrete Multivariate Analysis.
vi. Advanced Topics in Sampling Theory.
vii. Advanced Design of Experiments.
viii. Topic in Reliability Analysis.
ix. Statistical Quality Control.
x. Advanced Inference.
xi. Reliability Theory and Survival Analysis.

(Syllabi for all these papers is the same as it was for the pre-revised M.Phil course)