

CENTRAL UNIVERSITY OF SOUTH BIHAR

DEPARTMENT OF STATISTICS

Course Structure for the Course Work of PhD(Statistics) Programme

Course	Credit
Semester-I	
STS-901: Research Methodology	4
STS:902: Tools and Techniques of Research	4
Semester-II	
STS: 903 Preparation and Presentation of Research Proposal	4
Total Credits	12

Semester-I

STS:901 Research Methodology

Credit: 4

Part A (2 Credits)

Unit I: A Conceptual Framework

- Research: meaning and concept
- Knowledge, facts, principles, theories and research as a source of knowledge
- Scientific method of inquiry and basic steps of research
- Types of research: Basis, Applied and Action and Action Research
- Ethics in research
- Methods and methodology
- Intellectual and property right

Unit II: Computer Applications

Word Processing, Data processing, Graphical processing, Use of web tools for research, Use of multimedia tools.

Part B (2 Credits)

Unit III: Literature Survey:

Research paper, sources and access, various indicators of quality of research; citations, indexing and impact factors, etc. Conferences, workshops, seminars, etc. and proceedings, books, thesis, and dissertation, access-Google Scholar, Web of Science, JSTOR, Archives. Data repository.

Unit IV: Report Writing:

Research paper and effective way of writing for publication, thesis and thesis layout, content and chapters, sequencing of chapters, bibliography and references, introduction to LaTeX, scientific word and EndNote softwares.

References:

1. Anderson, J., Berry, H. D. and Poole M. (1994). Thesis and assignment writing, 2nd ed., Wiley Eastern Limited, New Delhi.
2. Kothari, C. R. (2018). Research Methodology: Methods and Techniques, 4th ed., International(P) Limited publishers, New Delhi.
3. Kottwitz, S. (2011). LaTeX for Beginners, Open source, Packt publishing Ltd, UK
4. Rajaraman, V and Adabala, N. (2015). Fundamental of computer, 6th ed., Prentice Hall India, New Delhi.

STS:902 Tools and Techniques of Research

Credit: 4

Unit-I: Introduction to efficient data collection methods and designing of experiments for data collection-Stratification, probability and non-probability sampling, RBD, Homogeneity in data, etc. Missing data imputation techniques. Resampling methods-Bootstrap, Jackknife, etc.

Unit-II: Non-linear data and generalized linear models-Poisson regression, binomial regression, negative binomial regression, etc. Bayesian analysis-predictive posterior density, Bayes factor, credible intervals. Model assessment tools and criteria-cross validation techniques, AIC, BIC, DIC, WAIC.

Unit-III: Statistical Computation: Exposure to software packages, e.g. R programming, general optimization techniques-Newton Raphson, Fisher scoring, gradient decent, etc. EM algorithm. Monte Carlo integration, sampling importance sampling (SIR). Markov Chain Monte Carlo techniques-Gibbs sampling, Metropolis Hastings algorithm.

Unit-IV: Dimension reduction techniques- principle component analyses, factor analysis, cluster analysis, multidimensional scaling. Canonical variables and canonical correlation, discriminant analysis, classification, multivariate analysis of variance (MANOVA). Introduction to variable selection techniques.

References:

1. Agresti, Alan (2015). Foundations of Linear and Generalized Linear Models, Wiley.
2. Bernardo, J.M. and Smith, A.F.M.(1994). Bayesian Theory, Wiley.
3. Box, G.P. and Tiao, G.C.(1992). Bayesian Inference in Statistical Analysis, Wiley.
4. Charnick, M. R. and Labudde, R. A. (2011). An Introduction to Bootstrap Methods with Application to R, Wiley.
5. Dempster, A.P., Laird, N. M. and Rubin, D. B. (1977). Maximum Likelihood from Incomplete Data via the EM algorithm, J. Royal Stats. Soc., Series B (Methodological), 39(1), 1-38, Wiley.

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6. Dunn, P. K. and Smyth, G. K. (2018). Generalized Linear Models with Examples in R, Springer.
7. Efron, B. and Tibshirani, R. J. (1994). An Introduction to Bootstrap, Taylor and Francis Ltd., New York
8. Gemerman, D.(2006). Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference, 2nd ed. Chapman & Hall.
9. Hardle, W and Simar, L. (2003). Applied Multivariate Statistical Analysis, Tech, Methods and data technologies.
10. Johnson, R. and Wichern, D. W. (2013). Applied Multivariate Statistical Analysis. 6th ed. Pearson.
11. Leonard, T. and Hsu, J.S.J. (2001). Bayesian Methods, Cambridge University Press.
12. McCullagh, P. and Nelder, J. A. (1989). Generalized Linear Models, 2nd ed., Chapman & Hall/CRC
13. Robert, C.P. and Casella, G.(2004). Monte Carlo Statistical Methods, 2nd ed. Springer Verlag.
14. Robert, C. P. (1994). The Bayesian Choice: A Decision Theoretic Motivation, Springer-Verlag.
15. Rubin, D. and Little, R. J. A. (2002). Statistical Analysis with Missing Data, 2nd ed.
16. Singh, Sarjinder. (2003). Advanced Sampling Theory with Applications. Kluwer Academic Publishers, Netherlands.
17. Stone. M. (1974). Cross-Validatory Choice and Assessment of Statistical Predictions, J. Royal Stats. Soc., Series B (Methodological), 36(2), 111-147, Wiley.
18. Sukhatme, P. V., Sukhatme, B. V., Sukhatme, S. and Asok, C. (1984). Sampling Theory of Surveys with Applications. Iowa State University Press and Indian Society of Agricultural Statistics.
19. Wilkinson, D. J. (2012). Multivariate Data Analysis with R.

Semester-II

STS: 903 Preparation and Presentation of Research Proposal

Credit: 4

The research proposal on the topic chosen by the candidate for his/her PhD shall be submitted as computer typed script as per the writing discipline followed by a seminar presentation. Each student shall be required to describe in about 5000 words his/her individual subject of study in the intended area of research supported by selected bibliography.

Marking Scheme of Courses

Paper	End Semester Examination
STS-901	100 (written)
STS-902	100 (written)
STS-903	75 (research proposal) + 25 (Seminar presentation)

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