

VIKRAM UNIVERSITY, UJJAIN (M.P.)



According to Ph.D. Ordinance no. 11

COURSE WORK

Ph.D. (STATISTICS)

SESSION- 2018-2019

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**SCHOOL OF STUDIES IN STATISTICS
VIKRAM UNIVERSITY, UJJAIN (M.P.)**

EXAMINATION IN THE FACULTY OF SCIENCE

Ph.D. (Statistics) Course work

Scheme and course

(As per common ordinance No. 11, Item No-11(e) and (f))

Paper	Nomenclature	Credits	Marks
Paper I: STAT C- 01	Research Methodology	04	100 (60+40 CCE)
Paper II: STAT C- 02	Review of Published Research in the Relevant Field	03	100 (60 written report+ 40 oral presentation)
Paper III: STAT C - 03	Computer Applications	03	100 (60+40 CCE)
Paper IV: STAT C- 04	Advance Course in Statistics	03	100 (60+40 CCE)
Paper V: STAT C- 05	Comprehensive Viva - Voce	03	100
Total		16	500

Notes :

- 1) The candidate has to obtain a minimum of 55% of marks or its equivalent grade points in aggregate in the course work in order to be eligible to continue in the Ph.D. programme.
- 2) If a candidate obtains 'F' Or 'Ab' grade in the course/subject, he/she will be treated to have failed in that course. He /she has to reappear in the examination in the next semester.
- 3) If the candidate further fails in the course, he/she shall not be given another chance and shall be out of the Ph.D. programme.

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VIKRAM UNIVERSITY, UJJAIN

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Course Work

Ph.D. (STATISTICS)

Paper-I: STAT C-01: Research Methodology

Max. Marks 100

(60+40 CCE)

Credits: 04

Unit-I: Measures of central tendency- Arithmetic mean, Weighted mean, Median, Mode, Geometric mean, Harmonic mean; Measures of dispersion- Range, Quartile deviation, Mean deviation, Standard deviation, coefficient of variation, Moments- Relation between moments about mean in terms of moments about any point and vice versa, Effect of change of origin and scale of moments, Measures of skewness and kurtosis, Covariance, Karl Pearson's Coefficient of correlation, Rank Correlation, Linear regression, Regression coefficients, Properties of regression coefficient, Association of attributes.

Unit-II: Definitions of Mathematical probability, Statistical probability, Subjective probability, Axiomatic approach to probability, Conditional probability, independent events, Pairwise independent events, Discrete probability distributions- Binomial, Poisson, Negative Binomial, Geometric, Continuous probability distribution- Normal, Gamma, Beta, Exponential.

Unit-III: Parameter and Statistic, Sampling and Non- sampling errors, Hypothesis, Basic concepts concerning testing of hypothesis- Null and alternative hypothesis, Type-I and II errors, Level of significance, Two tailed and One tailed tests, Critical region, Power of test, Large sample tests- for single proportions, difference of proportions, single mean, difference of means, Small sample tests: t-test for single mean, difference of means, Paired t-test for difference of means, t-test for testing the significance of an observed sample correlation coefficient and observed regression coefficient, F-test for equality of two population variances, Chi-square (χ^2) test, Goodness of fit test, Test of independence of attributes, Non-parametric tests- One sample sign test, Two sample sign test (Paired sign test), Wilcoxon signed rank sum test (single sample), Wilcoxon matched pairs test, Mann-Whitney U test, Run test, Kruskal- Wallis test.

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Unit-IV: Ethical Issues- Code of Ethics in Research, Ethics and Research process, Importance of Ethics in Research, Ethical Committees- Commercialization- Copy right-royalty- Intellectual property and patent law- Track related aspects of intellectual property rights- Reproduction of published material- Plagiarism- citation and Acknowledgement- Reproducibility and accountability, Editing.

Unit-V: Meaning of Interpretation, Techniques of interpretation, Precautions in interpretation, Significance of report writing, different steps in writing report, types of reports, Oral presentation, Mechanics of writing a report, Precautions for writing research reports, Conclusions.

Books recommended

1. Kothari, C.R. and Garg, G. (2014): Research Methodology: Methods and Techniques, 3rd Edition, New age International publishers.
2. Gupta, S.C. and Kapoor, V.K. (2002): Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Educational publishers, New Delhi.
3. Garg, B.L., Karadia, R. Agarwal, F. and Agarwal, U.K. (2002): An introduction to Research Methodology, RBSA Publishers.
4. Sinha, S.C. and Dhiman, A.K. (2002) Research Methodology, ESS Publication.
5. Wadehra, B.L. (2002): Law relating to patents, trademarks, copyright designs and geographical indications, Universal law publishing.

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Course Work

Ph.D. (STATISTICS)

Paper II: STAT C-02: Review of Published Research in the Relevant Field

Max. Marks 100

(60 written report + 40 oral presentation)

Credits: 04

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Course Work

Ph.D. (STATISTICS)

Paper III: STAT C-03: Computer Applications

Max. Marks 100

(60+40 CCE)

Credits: 04

Unit I: Introduction to the Computer Fundamental: Characteristics of computers, Computer generations, Input Unit, Output Unit, Storage Unit, Arithmetic Logic Unit, Control Unit, Central Processing Unit, Input Devices, Output Devices, Classification of Computers, Computer Software, Relationship between Hardware and Software, Types of Software.

Unit II: MS Office: MS Word; Creating and Editing document, Formatting document, Use of Auto –text, Autocorrect, Spelling and Grammar Tools, Page Formatting, Page Border, Background, Creation of Ms-Word Mail Merge, Macros, Tables.

MS Excel: Creating and Editing worksheet, Fill Handle, Use Formulas and Functions, Preparing Charts.

MS Power Point: Creating, Manipulating and Enhancing Slides, Inserting Organizational Charts, Excel Charts, Using Word Art, Putting Animations and Sounds, Inserting Animated Pictures, Inserting Recorded Sound Effects.

Internet: Definition, Brief History, Its Basic Services: Electronic Mail, WWW Browsers, Uses of Internet.

Unit III: Programming in C: History of C, Importance of C, Basic Structure of C Programs, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables.

Operators and Expression: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special operators. Arithmetic expression and Evaluation of Expression.

Decision Making and Branching: Decision making with If statement: Simple If statement, The If ...Else Statement, Nesting of If...Else Statements, The Else If ladder, The Switch statement, The while statement, The do statement, The for statement , Jumps in Loops.

Arrays: Introduction , One-Dimensional Array , Declaration and Initialization of One-Dimensional Array, Two-Dimensional Array and its Initialization, Multi-Dimensional Array.

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Unit IV: A brief introduction to R and Descriptive statistics: An overview of R, Vectors, Factors, Data frames, Matrices, Functions, Operators, and loops, Mean, Median, Standard deviation, Variance, Quantiles. Correlations, Simple linear regression, Pearson correlation, Rank Correlation.

Unit V: Graphics in R and Testing of One- and Two-sample in R in R: Histograms, Q-Q plots, Parallel Boxplots, Stripcharts, Barplots, Pie charts.

One-sample t test, Wilcoxon signed-rank test Two-sample t test, Two-sample Wilcoxon test, The paired t test, One-way analysis of variance, Bartlett's test, Kruskal-Wallis test Two-way analysis of variance.

Recommended Books

1. Balagurusamy, E. (2012): Programing in ANSI C. Tata McGraw Hill.
2. Dalgaard, P. (2008): Introduction to Statistics with R, Second Edition, Springer.
3. Kanetkar, Y. (2008): Let Us C, BPS Publication.
4. Rajaraman, V. (2003). Fundamental of Computers. PHI Learning Pvt. Ltd.
5. Sinha, P.K. and Sinha, P. (2007): Computer Fundamentals, BPS Publication.
6. Venables, W. N. Smith, D. M. and the R Core Team: An Introduction to R.

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Ph.D. (STATISTICS)

Paper-IV:STAT C-04: Advance Course in Statistics

Max. Marks 100

(60+40 CCE)

Credits: 04

Unit-I: Asymptotic relative efficiency of tests, Pitman's theorem. Asymptotic relative efficiency of sign test, Mann-Whitney U test. Robustness: Robustness of sample mean. Sample median.

Unit- II: Simulation- What is Simulation, Types of Simulation, Why to use Simulation, Limitations of Simulation techniques, phases of simulation model, Random Variable Generation- U(0,1), Exponential, Gamma, and Normal Random Variables, Monte-Carlo Simulation, Simulation and its applications.

Unit-III: Exponential Failure Model- Some properties of exponential distribution, Estimation of mean life with complete samples, Reliability estimation, Estimation with Failure censored samples, Bayes Estimation with one parameter and two parameters Exponential distributions, Series System with identical components, Parallel system.

Unit- IV: General theory and review of control charts for attribute and variable, OC and ARL of control charts, Cusum charts using V-mask and decision interval, Economic design of X- bar chart, Acceptance sampling plans for attributes inspection; Single and double sampling plans and their properties; plans for inspection by variables for one-sided and two-sided specification, Sequential sampling plan and its properties.

Unit-V: Ratio and regression methods of estimation in two phase (or double) sampling, Chain- ratio type estimator for population mean, its bias and mean squared error to the first degree of approximation. Comparison of chain ratio type estimator with sample mean and usual ratio estimator in two phase sampling, Stratification using two-phase sampling, post stratification, Effects of Non-response, Hansen and Hurwitz technique, Randomized response technique, Warner's method, Simmons Unrelated Question. Randomized Response model.

Recommended Books

1. Cochran, W.G. (1977): Sampling Techniques. Third Edition, Jhon Wiley & Sons, New York.
2. Kanti Swarup, Gupta, P.K. and Manmohan: Operations Research, Sultan Chand & Sons, New Delhi, India.

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3. Montgomery, D.C. (1985): Introduction to Statistical Quality Control, Wiley.
4. Montgomery, D.C. (1985): Design and Analysis of Experiments, Wiley.
5. Murthy, M.N. (1967): Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
6. Ott, E.R. (1975): Process Quality Control; McGraw Hill.
7. Sharma, S.D. (2003): Operations Research, Kedarnath Ram Nath & Co. Fourteen edition, Meerut, Indian
8. Sinha, S.K. (1986): Reliability and Life Testing. Wiley Eastern Limited.
9. Singh, S. (2003): Advanced Sampling Theory with Application, How Michael 'selected' Amy, Volume I & II, Kluwer Academic Publishers, The Netherlands.
10. Sukhatme, P.V., Sukahtme, B.V., Sukhatme, S. and Asok,C. (1984): Sampling Theory of Surveys with applications, Iowa State University Press and Indian Society of Agricultural Statistics, New Delhi.
11. Wetherill, G.B.(1977): Sampling Inspection and Quality Control, Halsted Press.
12. Lehmann, E.L.(2008) : Testing Statistical Hypothesis. Willy Eastern New Delhi.
13. Rohtagi, V.K. (1976): An Introduction to Probability Theory and Mathematical Statistics.
14. Huber, P.J.: Robust Statistics.

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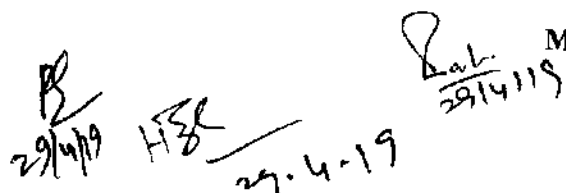
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Course Work

Ph.D. (STATISTICS)

Paper-V:STAT C-05: Comprehensive Viva-Voce

Handwritten signatures and dates:
1. A signature above the date 29/4/19.
2. The initials HSR above the date 29.4.19.
3. A signature above the date 29/4/19.
Max. Marks 100